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THE

MINERALOGICAL MAGAZINE

AND

Journal of

The Mineralogical Society.

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EDITED BY L. J. SPENCER, M.A.

ASSISTED BY A COMMITTEE OF COUNCIL.

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1919.

EXCERPT MINUTES OF COUNCIL MEETING.

Held in the Apartments of the Geological Society, Burlington House, London, W., March 18, 1919, *at* 5 *p.m.*

Sir WILLIAM P. BEALE, President, in the Chair.

Mr. Sidney Melmore was provisionally elected an Ordinary Member of the Society.

The audited balance-sheet for the year ending December 31, 1918, was approved, and the Secretary was instructed to insert it in the Minutes and publish it in the next number of the Journal.

An invitation from the Federal Council for Pure and Applied Chemistry for the Mineralogical Society to become a constituent body was accepted, and Dr. Prior was appointed to act as the Society's representative.

The President, the General Secretary, and the Editor of the Journal, in conjunction with Sir Lazarus Fletcher and Sir Henry Miers, were appointed Editorial Committee of the Journal.

GENERAL MEETING.

Held in the Apartments of the Geological Society, Burlington House, London, W., March 18, 1919, *at* 5.30 *p.m.*

Sir WILLIAM P. BEALE, President, in the Chair.

Twenty-two Members were present.

The election of Mr. S. Melmore as an Ordinary Member of the Society was confirmed.

The following papers were read:—

1. Curvature in crystals: by Mr. L. J. Spencer.
2. Siliceous sinter from Lustleigh, Devon: by Lieut. A. B. Edge.
3. An anorthic metasilicate of iron, manganese, &c., from an acid slag: by Mr. A. F. Hallimond (p. 368).
4. The meteorites Adare and Ensisheim: by Dr. G. T. Prior (p. 349).

A new form of Students' Goniometer was exhibited and described by Dr. G. F. Herbert Smith (p. 366).

Specimens in illustration of their papers were exhibited by Lieut. Edge and Mr. Hallimond.

EXCERPT MINUTES OF COUNCIL MEETING.

Held in the Apartments of the Geological Society, Burlington House, London, W., June 17, 1919, *at* 5 *p.m.*

Dr. A. E. H. Tutton, F.R.S., Past-President, in the Chair.

Mr. A. Brammall was provisionally elected an Ordinary Member of the Society. The deaths of Sir William Crookes and Mr. A. E. V. Zealley were announced.

The following changes in the list of Officers and Council were approved for recommendation to the Members of the Society:—Ordinary Members of Council—Messrs. Hallimond, Hatch, Howe, and Campbell Smith, in place of the four retiring Members of Council, Messrs. Collingridge, Crook, Herbert Smith, and Thomas.

It was decided to make a donation of £5 to the Conjoint Board of Scientific Societies.

GENERAL MEETING.

Held in the Apartments of the Geological Society, Burlington House, London, W., June 17, 1919, *at* 5.30 *p.m.*

Dr. A. E. H. Tutton, F.R.S., Past-President, in the Chair.

Twenty-one Members and two Visitors were present.

The election of Mr. A. Brammall as an Ordinary Member of the Society was confirmed.

Mr. A. E. Kitson exhibited diamonds from a new occurrence in the Gold Coast.

The following papers were then read:—

1. Andalusite (Chiastolite): its genesis, morphology, and inclusions: by Mr. A. Brammall.

2. The mineral composition of oolitic Ironstones: by Mr. R. H. Rastall.

3. Eighth list of new mineral names: by Mr. L. J. Spencer (p. 373).

MINERALOGICAL SOCIETY.

ABSTRACT OF RECEIPTS AND PAYMENTS FROM JANUARY 1 TO DECEMBER 31, 1918.

Receipts.	£ s. d.	£ s. d.
Balance from 1917—		
Bank	95 13 5	
Office	6 6	
		95 19 11
Subscriptions—(1) current	46 4 0	
(2) arrears	16 16 0	
		63 0 0
Entrance Fees and Compositions		34 13 0
Sale of publications—		
By Publishers	15 7 11	
„ G. Savigar	2 0	
		15 9 11
Interest on Investments		21 14 7
		£230 17 5

Payments.	£ s. d.	£ s. d.
Printing Magazine (No. 85)	65 16 10	
Authors' copies	6 19 0	
Illustrations	11 13 6	
		84 9 4
Miscellaneous Printing (Williams & Strahan)		8 3 9
Editor's Honorarium (1917)		10 10 0
G. Savigar for care of Stock (1917)		1 1 0
Porter's Fee at meetings (1918)		1 0 0
Fee for manipulating lantern (1917)		10 0
Postage and Parcels—		
Magazine (1918)	2 11 2	
G. Savigar (1917)	3 3	
Hon. Secretary (1917)	7 11	
Hon. Treasurer (1918)	7 8	
		3 10 0
Investments. National War Bonds (1927)		50 0 0
Balance at Bank	71 11 8	
At Office	1 8	
		71 13 4
		£230 17 5

Examined and compared with the vouchers, and found correct.
8 *March*, 1919.

(*Signed*) THOS. CROOK
FRANCIS H. BUTLER } Auditors.

BALANCE SHEET.

DECEMBER 31, 1918.

LIABILITIES.	£	s.	d.
Owing for Editor's Honorarium (1918)	10	10	0
„ G. Savigar for care of stock of Publications (1918)	1	1	0
„ Do. for postage (1918)		9	3
„ Hon. Secretary for postage (1918)		14	9
„ Do. for new Minute book		7	6
„ fee for manipulating lantern (1918)		15	0
„ Williams & Strahan for miscellaneous printing	4	5	0
Excess of assets over liabilities	939	8	1
	£957	10	7

ASSETS.	£	s.	d.	£	s.	d.
Balance at Bank	71	11	8			
At Office		1	8			
				71	13	4
5 per cent. War Loan (£850) and Bonds (£50) valued at				850	10	0
Sale of Publications (1918)— Owing from Publishers				14	7	3
Arrears of Subscriptions valued at				21	0	0
				£957	10	7

Number of Life Members, 47.

The stock of Publications and the value of the Library are not included in the above assets.

(*Signed*) JOHN W. EVANS,
Hon. Treasurer.
8 March, 1919.

THE MINERALOGICAL MAGAZINE

AND

JOURNAL OF

THE MINERALOGICAL SOCIETY.

No. 87. November, 1919. Vol. XVIII.

A method for the quick determination of the approximate amount and composition of the nickeliferous iron in Meteorites; and its application to seventeen meteoric stones.[1]

By G. T. Prior, M.A., D.Sc., F.R.S.

Keeper of the Mineral Department of the British Museum.

[Read June 18, November 5, 1918; March 18, 1919.]

In the classification proposed by the author in a previous paper[2] meteorites are divided into five groups according to the ratio of iron to nickel in the nickeliferous iron they contain. In the case of the meteoric irons such a classification, as shown by Farrington's list of analyses,[3] is a natural one, since the structure of the irons, as revealed by etching, varies with the amount of nickel they contain. Thus Group 1, in which the metal is poor in nickel, with a ratio of Fe to Ni of 13 upwards, includes nickel-poor ataxites, hexahedrites, and coarsest and coarse octahedrites; Group 2, in which Fe : Ni = 8–13, the rest of the

[1] Communicated by permission of the Trustees of the British Museum.

[2] G. T. Prior, Mineralogical Magazine, 1916, vol. xviii, p. 42.

[3] O. C. Farrington, 'Analyses of Iron Meteorites Compiled and Classified.' Field Museum of Natural History, Chicago, 1907, Publication 120, Geol. Series, vol. iii, No. 5.

octahedrites from medium to finest; Group 3, in which Fe : Ni = 5–8, nickel-rich ataxites; Group 4, in which Fe : Ni = 2–5, ataxites still richer in nickel; while Group 5 may include the doubtful Oktibbeha meteorite in which the ratio of iron to nickel is even less than one.

The extension of this classification to the chondrites and achondrites is not arbitrary, but is justified by the fact that in their case also the grouping is a natural one; for the author's analyses, together with those of Fletcher, Penfield, Hillebrand, Borgström, Mingaye, and others, indicate that in these stony meteorites the amount of ferrous oxide in the magnesium silicates varies directly with the percentage of nickel in the nickeliferous iron. Thus the chondrites of Daniel's Kuil (Hvittis) type and the achondrites of bustite type, of Group 1, which contain nickel-iron poor in nickel like that of the hexahedrites and coarse octahedrites, have magnesium silicates almost free from oxide of iron; while the chondrites and achondrites, containing metal of composition similar to that of the meteoric irons of Groups 2–5, have magnesium silicates richer and richer in ferrous oxide.

The explanation of these facts offered by the author was that the meteorites, both irons and stones, in these different groups differed by the degree of oxidation the magma which produced them had suffered, those of Group 1, *to which the sulphur minerals oldhamite and daubreelite are practically confined*, being the poorest in oxygen. Support to this view was afforded by the fact that in the majority of meteorites the less the amount of nickeliferous iron the richer it is in nickel; for by increasing oxidation the amount of nickel-iron would diminish, the oxidized iron passing into the composition of the magnesium silicates while the residual metal became richer and richer in nickel, since the latter would suffer no very appreciable oxidation so long as any iron remained in the metallic state. The idea that the nickel-content of the nickel-iron in meteorites varied inversely with the amount of nickel-iron had been enunciated by Flight[1] nearly forty years ago, but had hitherto met with no general acceptance. The author, in a previous paper, has brought forward evidence from his own and other analyses to prove that it is substantially true for meteorites generally, although a few exceptions occur, notably amongst the achondrites in the case of the bustites and ureilites. The analyses given in the present paper, with two exceptions, serve to confirm the general accuracy of the idea in the case of chondritic stones.

If meteorites are to be classified by the factor which is seen to

[1] W. Flight, Proc. R. Soc. London, 1881-2, p. 34; 'A chapter in the history of meteorites,' 1887, p. 222.

determine many of their other characters, i. e. by the amount of nickel in their metallic constituent, a fairly quick method for the determination of the approximate amount and composition of the nickel-iron is desirable.

The method adopted by the author is based on that described in a previous paper.[1] A 10–20 gram fragment of the meteorite is crushed until all the material except the larger particles of metallic iron passes through a sieve of about 80 meshes to the linear inch (about 0·20 mm. diameter of aperture). The fine sieved material, in small portions at a time, is then separated into unattracted (weight in grams $= w$) and attracted portions by repeated combing with a magnetic comb, the attracted parts being added to the coarse metallic particles. The attracted material (weight W), consisting of metal together with a certain amount of unattractive material entangled with it, is digested with dilute (two of water to one of concentrated acid) aqua regia until all the metal is dissolved. The insoluble residue consisting mainly of pyroxene is allowed to settle, as much as possible of the perfectly clear solution is decanted off, and the insoluble is then washed mainly by decantation. It is then digested for a short time with strong sodium carbonate solution to remove any silica derived from the soluble silicate, and after being again washed is dried at 100° C. and weighed (weight $= i$). The solution of the iron is evaporated to dryness and the rest of the silica from the soluble silicate is separated and weighed. The weight (s) of the soluble silicate is given fairly approximately by multiplying the silica total by 2·6, since the ratio of olivine to its silica in most meteorites varies only from 2·5 to 2·7. After the separation of silica, the solution of the iron is collected in a measured flask, and the nickel (weight $= n$) is determined by precipitation with dimethylglyoxime in an aliquot portion. In other portions of the solution sulphur and phosphorus may be estimated, though the latter in most cases is in negligible amount. From the weight of sulphur the weight (t) of troilite in the attracted material is calculated. The actual weight of nickel-iron in the attracted material is approximately $W-i-s-t = f$, and the ratio of iron (with a little cobalt) to nickel is then $\frac{f-n}{n}$; and the percentage amount of nickel-iron in the meteorite is $\frac{100\,f}{W+w}$.

This simple and fairly expeditious method gives perfectly reliable results as regards the amount of nickel, for there is no uncertainty in its determination, as is the case when the iron and nickel are separated by

[1] G. T. Prior, Mineralogical Magazine, 1913, vol. xvii, p. 24.

ammonia or even by sodium acetate when proper precautions[1] are not observed.

The following meteorites, to the analysis of which the method has been applied, include many of those, enumerated in a list given in the previous paper,[2] of which the results of the older analyses were most at variance with the author's views.

The results of the analyses of the attracted material are as follows :—

	Adare.	Gnaden-frei.	Shel-burne.	Chanda-kapur.	New Concord.
Insoluble silicate (*i*)	22·35	20·76	14·70	11·36	18·50
Soluble silicate (*s*)	16·64	12·14	13·17	11·01	14·98
FeS (*t*)	1·93	1·14	2·52	trace	2·53
Ni (*n*)	4·93	4·87	6·45	7·89	6·99
Fe (+ Co) by diff.	(54·15)	(61·09)	(63·16)	(69·74)	(57·00)
	100·00	100·00	100·00	100·00	100·00
Weight of Attracted (*W*) ...	2·7384	2·6743	1·6049	1·1390	2·6743
,, Unattracted (*w*)	6·1524	5·4790	9·1931	9·9377	5·4790

	Henderson-ville.	Felix.	Eli Elwah.	Lunds-gård.	Château Renard.	Shytal.
Insoluble silicate ...	7·00	6·83	8·98	7·24	6·87	11·65
Soluble silicate ...	7·77	13·39	6·55	5·30	5·14	9·00
FeS	trace	trace	trace	trace	trace	trace
Ni	9·39	8·59	10·09	11·10	11·49	10·79
Fe (+ Co) by diff. ...	(75·84)	(71·19)	(74·38)	(76·36)	(76·50)	(68·56)
	100·00	100·00	100·00	100·00	100·00	100·00
Weight of Attracted	0·2006	0·1033	0·5939	1·0161	0·8708	1·1728
,, Unattracted	6·3413	5·4451	7·3865	9·5105	8·3196	11·5634

	Bluff.	Kakowa.	Cyn-thiana.	Ensisheim.	Dhurm-sala.	Lodran.
Insoluble silicate ...	7·77	13·31	11·21	7·51	15·12	2·73
Soluble silicate ...	8·55	8·53	13·39	8·08	14·99	4·91
FeS	trace	trace	trace	trace	trace	trace
Ni	11·09	11·14	10·67	18·26	15·41	7·36
Fe (+ Co) by diff. ...	(72·59)	(67·02)	(64·73)	(66·15)	(54·48)	(85·00)
	100·00	100·00	100·00	100·00	100·00	100·00
Weight of Attracted	0·5932	0·8343	0·7886	0·4955	0·5343	1·0756
,, Unattracted	9·4175	7·3248	9·2866	11·9291	9·4795	2·2594

The percentage amounts, in whole numbers, of the nickeliferous iron in these meteorites, and the ratios of iron (+ cobalt) to nickel in it, as calculated from the above analyses, are given in the following table under (1) as compared with the results of the older analyses given under (2)[3] :—

[1] e.g. The addition of sufficient acetic acid, after the neutralization of the solution with sodium carbonate and the addition of sodium acetate.

[2] G. T. Prior, Mineralogical Magazine, 1916, vol. xviii, p. 33.

[3] The numbers calculated from the older analyses are taken from the previous paper (loc. cit., pp. 31–35).

	Percentage of Nickel-iron.		Ratio of Fe (+Co) to Ni.		Group.
	(1)	(2)	(1)	(2)	
Cronstad (type)	18½	—	11	—	C 2
Adare	12	19	11	6	C 2
Gnadenfrei	21½	26	12½	5½	C 2
Shelburne	10½	8	10	10	C 2
Chandakapur	8	6	9	10	C 2-3
New Concord	10	10½	8	7	C 2-3
Hendersonville	2½	2½	8	11	C 2-3
Felix	1½	3	8	7	C 2-3
Baroti (type)	9	—	6½	—	C 3
Eli Elwah	6½	—	7½	—	C 3
Lundsgård	8½	12	7	5	C 3
Château Renard	8½	8½	6½	4	C 3
Shytal	7½	10	6½	6	C 3
Bluff	5	5½	6½	5	C 3
Kakowa	8	8	6	6	C 3
Cynthiana	6	6	6	11	C 3
Soko-Banja (type)	4	—	3	—	C 4
Ensisheim	3½	9	3½	7	C 4
Dhurmsala	3½	8	3½	4	C 4
Lodran	30	—	11½	7	A 2

The analysis of Lodran was undertaken because the older analysis gave a ratio of iron to nickel of 7, which was anomalous considering the high ratios of MgO to FeO in the pyroxene and olivine. The above result brings Lodran into conformity with most of the other stony-irons.

The results of the analyses, with two exceptions, support the idea that in most chondritic stones the proportion of nickel in the nickel-iron varies inversely as the amount of nickel-iron. This is very evident in the case of such extremes as Adare and Gnadenfrei on the one hand and Ensisheim and Dhurmsala on the other, but in the intermediate cases belonging to Group 3 the interrelation is not rigidly exact for the comparatively small samples used in the analyses, and Hendersonville and Felix are certainly exceptions. The new analyses of the metallic constituents of the two latter stones do not differ very materially from the previous ones. They show that both meteorites contain nickel-iron, in small amount, but not correspondingly very rich in nickel. According to the previous analyses, however, the magnesium silicates of Hendersonville and the insoluble silicate of Felix are poor in oxide of iron and thus agree with the composition of the nickel-iron in placing both meteorites in Group C 2–3.

Semseyite from Dumfriesshire.[1]

By G. F. Herbert Smith, M.A., D.Sc., F.G.S.

Assistant in the Mineral Department of the British Museum.

With a Chemical Analysis by G. T. Prior, M.A., D.Sc., F.R.S.

Keeper of the Mineral Department of the British Museum.

[Read November 5, 1918.]

EARLY in the year 1918 Mr. Arthur Russell picked up at the old antimony-lead mine at Glendinning[2] in Eskdale, Dumfriesshire, specimens of the antimony-lead ore found there, in which were small cavities lined with a drusy layer of minute crystals; these, being markedly deeper in colour than the stibnite forming part of some of the specimens, belonged to a different species, and probably a sulphantimonite of lead. Mr. Russell brought some of the specimens to the Museum, and some of the small crystals were examined with the view of determining the species to which they belong. He afterwards presented to the Trustees the two specimens[3] used in the investigation. The crystals are associated with stibnite, valentinite, ankerite, calcite, blende, and pyrites.

[1] Published by permission of the Trustees of the British Museum. The paper was read under the title, 'A plagionite-like mineral from Dumfriesshire.'

[2] A brief description of the mine is given by Robert Jameson in his book, 'A Mineralogical Description of the County of Dumfries,' Edinburgh & London, 1805, pp. 73–74:—'About ten years ago, a vein of grey antimony ore was opened in Glendinning in Eskdale. The working was continued for some time with much profit to the adventurers, but it has been lately given up, it is said owing to want of skill in the miners and energy in the proprietors. The vein traverses greywacke; but its extent, direction, dip, or width, I was not able to ascertain, as the workings had fallen in. The vein stones are quartz, and calc-spar; the ores grey antimony, brown blende, fine-grained lead glance, and iron pyrites.'

[3] The specimens are numbered 404 and 405 for the year 1918 in the General Register of Acquisitions in the Mineral Department.

So closely are the crystals intergrown, and so small are they, that it was a matter of extreme difficulty to isolate any of them sufficiently to permit of their being measured on the goniometer. The instrument used was the smaller three-circle goniometer[1] in the British Museum. Without the facilities provided in a goniometer of this kind it would scarcely have been possible to disentangle the reflections given by these complex intergrowths of tiny crystals. Altogether seven crystals were examined, but the measurements of only two of them are worth recording.

Crystal No. 1 (fig. 1) measures about 0·4 mm. in its greatest width,

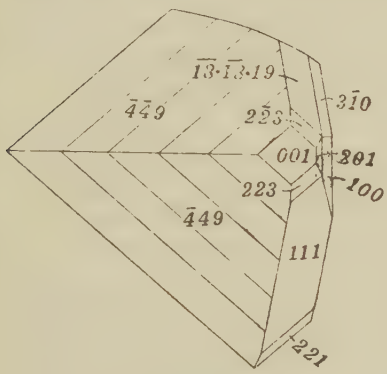


Fig. 1.

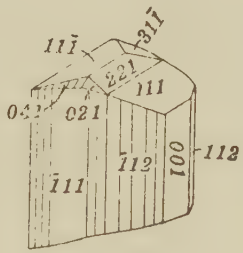


Fig. 2.

Crystals of Semseyite from Glendinning, Dumfriesshire.

and is the largest and by far the best developed of all the crystals observed. So much does it excel the other crystals examined that it alone was used for determining the fundamental constants and calculated values of the bi-angular co-ordinates. In its habit it closely resembles one of the crystals of plagionite figured and described by Luedecke.[2] Two conspicuous zones of faces intersect in a lozenge-shaped face; the zone of symmetry is present, but is far less noticeable. Two points call for remark. In the first place, the face that should correspond to the face (111) on the other side of the equatorial plane of symmetry is not quite in the place where it would have been expected to be; it lies in the

[1] Mineralogical Magazine, 1899, vol. xii, pp. 175–182.

[2] O. Luedecke, 'Über die Formen des Plagionits (Rose).' Neues Jahrbuch für Mineralogie, etc., 1883, ii, pp. 112–116, fig. 2; 'Die Minerale des Harzes,' Berlin, 1896, plate VI, fig. 4. The same crystal is represented, but in a different orientation, as fig. 2 by E. S. Dana in 'System of Mineralogy', sixth edition, 1892, p. 118.

zone [001 : 1$\bar{1}$1], but its angular distance from (001) is more than a degree of arc less than is required for the face (111), and the lowest indices that can be given to it are as high as (18.$\bar{1}$8.19). Shifts of this kind testifying to a disturbance in the growth of the crystal are not uncommon in a heterogeneous intergrowth of crystals which have originated from different centres. In the second place, the large faces belong to the form ($\bar{4}$49) and not ($\bar{1}$12) as is suggested by the apparent parallelism of the large pair of opposite sides.

The angles used as data for calculating the fundamental constants and the values of the bi-angular co-ordinates were the angular distances of origin face (001) from the faces (100) and (201) respectively and the azimuthal angle of the face (111) subtended at the origin. All the measurements were made from the face (001) as origin.

Table I. Calculated and observed values of the angular co-ordinates of the faces on Crystal No. 1.

Facial Indices.	Refl.[1]	Observed.		Calculated.	
		ϕ	ρ	ϕ	ρ
($\bar{2}$01)	f	0° 0′	73° 31′	0° 0′	73° 32′
(201)	f	,, ,,	49 18	,, ,,	49 18
(100)	f	,, ,,	74 14	,, ,,	74 14
(310)	f	20 52	75 5	20 44	75 12½
($\bar{4}\bar{4}$9)	s	48 35	33 50	48 38	33 8½
(223)	f	,, ,,	37 6	,, ,,	36 54
(111)	f	,, ,,	46 32	,, ,,	46 28
(221)	f	,, ,,	60 9	,, ,,	60 23
($\bar{4}$49)	b	48 41	33 40	,, ,,	33 8½
(22$\bar{3}$)	b	,, ,,	37 23	,, ,,	33 8½
(2$\bar{2}$3)	b	,, ,,	37 23	,, ,,	36 54
($\bar{1}$8.$\bar{1}$8.19)	f	,, ,,	45 16	,, ,,	45 13

Crystal No. 2 (fig. 2), which was much smaller than the preceding and measured less than 0·2 in its greatest width, was the best of an intergrown group of crystals, of about the same size as it, which could not safely be broken up any more. All these crystals simulate a prismatic habit, but the two prominent zones are the same as those shown by the preceding crystal, although the forms present differ. Signs of a disturbance in the growth of the crystal are revealed by the presence of a face, to which the simplest indices that can be assigned are (55$\bar{6}$). As before, the measurements were made from the face (001) as origin.

[1] The letters indicate the quality of the reflections, viz. f fair, b bad, s striated.

Table II. Calculated and observed values of the angular co-ordinates of the faces of Crystal No. 2.

Facial Indices.	Refl.	Observed.		Calculated.	
		ϕ	ρ	ϕ	ρ
($\bar{2}01$)	b	0° 0′	73° 23′	0° 0′	73° 32′
(201)	b	,, ,,	49 2	,, ,,	49 18
(100)	b	,, ,,	74 0	,, ,,	74 14
(31$\bar{1}$)	b	20 58	84 9	20 44	84 30
(111)	b	48 20	46 40	48 38	46 28
(221)	b	,, ,,	60 46	,, ,,	60 23
(112)	b	48 31	30 39	,, ,,	30 16
($\bar{1}$12)	b	,, ,,	35 53	,, ,,	36 43
($\bar{1}$11)	f	,, ,,	59 40	,, ,,	60 0½
(11$\bar{1}$)	b	48 35	59 33	,, ,,	,, ,,
(223)	b	48 51	37 15	,, ,,	36 54
(111)	b	,, ,,	46 34	,, ,,	46 28
(55$\bar{6}$)	b	49 25	63 17	,, ,,	63 24
(021)	b	89 49	62 50	90 0	63 2
(041)	s	,, ,,	76 30	,, ,,	75 43½

The crystalline constants as determined from the data found from measurements made on Crystal No. 1 are

$$a : b : c = 1{\cdot}1356 : 1 : 1{\cdot}0218\,;\ \beta = 105° 46'.$$

The forms observed are as follows:—(100), (001), (201), ($\bar{2}$01), (310), (021), (041), (223), (111), (221), (112), ($\bar{1}$11), ($\bar{1}$12), ($\bar{4}$49), ($\bar{3}$11). The faces ($\bar{1}\bar{8}$.18.19) and ($\bar{5}$56) are probably vicinal to ($\bar{1}$11), and do not represent distinct forms.

Dr. G. T. Prior made an analysis of the drusy lining of one of the small cavities referred to, together with the compact black material immediately surrounding it. Owing to the extremely small size of the crystals it was not practicable to collect enough of them for analysis; but, inasmuch as there is no difference in colour and texture between the drusy lining and the underlying mass, it is not unreasonable to presume that the composition was uniform except for the carbonates from which the material for analysis could not be wholly freed. The mineral was decomposed in chlorine, and the lead was determined as sulphate, and the antimony as sulphide, after heating in carbon dioxide. The sulphur was estimated in a separate portion fused with sodium carbonate and potassium nitrate. Arsenic was tested for by the Babo method, but none was detected. The weight of the material used in the main analysis was 1·0980 gram, and that used for the sulphur determination was 0·7972

gram. As will be seen from the following table, the results of the analysis are in fair agreement with the figures previously obtained by Dr. Prior on material from Wolfsberg[1] and from Oruro[2], and by Sipöcz for the original semseyite described by Krenner, and with those required by the formula $9PbS.4Sb_2S_3$.

Table III. Analyses of Semseyite.

	I	II	III	IV	V
	Prior Glendinning.	Prior Wolfsberg.	Prior Oruro.	Sipöcz Felsöbánya.	$9PbS.4Sb_2S_3$.
Pb	52·37	51·84	52·9	53·16	53·29
Sb	25·49	28·62	24·8	26·90	27·47
S	18·81	19·42	18·7	19·42	19·24
Ag	—	—	1·6	—	—
Fe	0·67	—	—	0·10	—
Zn	trace	—	—	—	—
$CaCO_3$ ...	1·66	—	—	—	—
$MgCO_3$ ...	trace	—	—	—	—
Insoluble	0·81	—	—	—	—
	99·81	99·88	98·0	99·58	100·00
Sp. gr. ...	5·84	5·92	5·82	5·95	

The chemical analysis points conclusively to the crystals being semseyite; but a comparison of the crystallographical constants found above with those recorded for plagionite and semseyite, viz.—

Plagionite $a:b:c = 1{\cdot}1331:1:0{\cdot}8456$; $\beta = 107° 10\frac{1}{2}'$.[3]

Semseyite $a:b:c = 1{\cdot}1442:1:1{\cdot}1051$; $\beta = 108° 56'$.[4]

shows the agreement to be far from satisfactory. As regards the value for the angle between the axes, the value found for the Dumfriesshire crystals is 3° 10′ less than that recorded by Krenner for the Felsöbánya crystals, and, moreover, lies on the other side of the value for plagionite. Since the observations made on the present crystals were sufficiently trustworthy to preclude the possibility of any large error in the constants determined from them, it was considered advisable to review Krenner's

[1] Mineralogical Magazine, 1899, vol. xii, p. 62.

[2] Ibid., 1907, vol. xiv, p. 315.

[3] O. Luedecke, Neues Jahrbuch für Mineralogie, etc., 1883, ii, p. 116. His value for *c* is half that given above.

[4] J. Krenner, 'Egy Felsöbányán tabált új ólomérczröl.' A magy. tud. Akad. Értesitöje, 1881, vol. xv, pp. 111–113; abstract 'Ueber ein neues Bleierz von Felsöbanya.' Zeits. Kryst. Min., 1884, vol. viii, pp. 532–533.

method of calculating the constants for the crystals examined by him. He made use of the following three angles:—

$(113):(001) = 22° 44'$; $(221):(001) = 59° 38'$; $(221):(22\bar{1}) = 98° 58'$.

From the last two angles the azimuthal angle of the face (221) may be calculated to be 48° 51′, which differs little from the corresponding value, viz. 48° 38′, found for the Dumfriesshire crystals. The distance angles, which are respectively 59° 38′ and 60° 23′, differ by 45′, which is perhaps not unduly large considering the comparatively rough character of the Felsöbánya crystals. The face (113) did not occur on the Dumfriesshire crystals, but its distance angle may be found by calculation to be 21° 59′, which again differs 45′ from the value given by Krenner, viz. 22° 44′. The apparently large discrepancies between the constants found for the crystals from the two localities may therefore be really due to comparatively slight errors in the readings due to the imperfect development of the Felsöbánya crystals; certainly none of the latter crystals in the British Museum Collection will admit of goniometrical measurements which could in any degree be described as trustworthy.

On a comparison of the data determined for the semseyite from Dumfriesshire with those given for plagionite, it will be noticed that with the variation in chemical composition the first axial ratio remains almost, if not quite, unchanged, but the second ratio and the angle between the axes both vary.

A lead-grey, fibrous mineral from the Binn valley, Switzerland.

By R. H. Solly, M.A.

With a Chemical Analysis by G. T. Prior, M.A., D.Sc., F.R.S.[1]

Keeper of the Mineral Department of the British Museum.

[Read March 21, 1911.]

In a paper published many years ago the following passage occurs under the section treating of seligmannite:—'Mingled with the seligmannite, and partially coating the baumhauerite, are a number of very fine needles of a lead-grey colour, the nature of which I have as yet been unable to determine.'[2] These needles form the subject of the present paper.

I later secured many more specimens on which the crystals are much larger, and are arranged in the form of a lattice in the cavities of the dolomite. Sometimes they are sprinkled with minute crystals of seligmannite. In a common type of grouping a bundle of slender prisms crosses similar bundles in such a way as to form approximately equiangular triangles. No crystal has been found to show faces except in the prism-zone.

In cleavage and the chocolate-coloured streak this mineral resembles others of these lead-grey minerals, such as liveingite, rathite, baumhauerite, and dufrenoysite.

[1] Communicated by permission of the Trustees of the British Museum.

[2] R. H. Solly, 'Some new minerals from the Binnenthal, Switzerland,' Mineralogical Magazine, 1905, vol. xiv, pp. 72–82.

In the table below I record the angles observed on different crystals, the measurements in every instance being made from the cleavage-face. From the chemical analysis, which was kindly made by Dr. G. T. Prior, it appears that the composition of the crystals corresponds to rathite; but, on the other hand, as regards their interfacial angles, it will be seen from the table that they accord more closely with dufrenoysite. In the table are given the angles in the zones [100 : 010] of rathite and [010 : 001] of dufrenoysite, and also those in the zone [100 : 010] of hutchinsonite, which are added, because it is not without significance how closely they agree with the angles found for the present crystals. In each case the origin of measurements is the cleavage-face, which is (100) in hutchinsonite and rathite, and (010) in dufrenoysite.

Hutchinsonite.[1]		Dufrenoysite.[2]		Rathite.[3]		Fibrous Mineral.			
Form.	Angle.	Form.	Angle.	Form.	Angle.	Crystal 1.	Crystal 2.	Crystal 3.	Crystal 4.
—	—	(041)	22° 12′	(410)	21° 18′	21° 47′	—	—	—
—	—	(072)	25 0	(720)	24 1	24 49	—	—	—
—	—	(052)	33 8½	(520)	31 57	33 7	—	—	—
(730)	35° 0½′	(073)	34 58½	—	—	34 12	—	—	—
(120)	39 15	(021)	39 13	(210)	37 56	38 53	—	38° 35′	—
(320)	47 27	(032)	47 25	(320)	46 6	47 11	—	47 20	47° 27′
						47 20	—	47 25	—
—	—	(043)	50 45½	—	—	—	—	51 1	49 49
(540)	52 35½	(054)	52 33½	—	—	52 7	—	—	—
(110)	58 32	(011)	58 30½	(110)	57 19	58 19	58° 14′	58 28	58 12
						58 20	58 21		58 31
							58 51		
(340)	65 21	(034)	65 19½	(340)	64 18	—	—	64 56	—
(120)	72 59½	(012)	72 58	(120)	72 13	72 50	72 43	72 44	72 57
						73 0	72 54	72 48	
							72 55		
(140)	81 18	(014)	81 17½	(140)	80 53	80 17	—	—	—
—	—	(016)	84 10	—	—	—	—	84 32	—
(010)	90 0	(001)	90 0	(010)	90 0	—	89 32	—	—

Chemical Analysis.

The mineral (0·6730 gram) was decomposed in chlorine, and the constituents were determined in the usual way. Sulphur was determined on a separate portion, weighing 0·2666 gram. The presence of

[1] Mineralogical Magazine, 1907, vol. xiv, p. 287.
[2] Ibid., 1902, vol. xiii, p. 166.
[3] Ibid., 1912, vol. xvi, p. 197.

thallium is interesting.[1] The results of the analysis are given in the following table, and for comparison the percentages required for the formula of rathite, viz. $3PbS.2As_2S_3$, are added.

	Fibrous Mineral.	$3PbS.2As_2S_3$.
Pb ...	51·11 ...	51·36
Ag ...	0 76 ...	—
Cu ...	0·10 ...	—
Tl ...	0 23 ...	—
Fe ...	0·21 ...	—
As ...	23·37 ...	24·79
Sb ...	0·74 ...	—
S ...	23·22 ...	23·85
Insoluble ...	0·24 ...	—
	99·98 ...	100·00
Sp. gr. (D_4^{18}) ...	5·453	

[1] Compare A. Brun, Bull. Soc. franç. Min., 1917, vol. xl, p. 110.

A new mineral, isomorphous with trechmannite, from the Binn valley, Switzerland.

By R. H. Solly, M.A.

[Read March 21, 1911.]

In August 1904 I discovered in the Lengenbach quarry a specimen on which were three small, round-shaped crystals, about the size of small shot, grown upon a prismatic crystal of sartorite. I measured them, and owing to their small size experienced some difficulty in determining the position of some of the faces with the goniometer at my disposal, which was of the ordinary single-circle pattern. In the course of the short account of the history of the Lengenbach quarry which I gave at the meeting of the Mineralogical Society held on November 13, 1906, I briefly described these crystals, and a note based on information supplied by me was inserted by Desbuissons in his book.[1] I waited in the hope that further crystals might be discovered in subsequent years so as to permit of a chemical analysis of the mineral, but none was found, and I finally decided to place on record the result of my observations.

Just as in the case of trechmannite these crystals belong to the diplohedral-rhombohedral type of symmetry, and the fundamental angle $(111 : 100) = (0001 : 0\bar{1}11)$, is 38° 18′, as compared with 37° 1′ for the corresponding angle of trechmannite. The new crystals possess a cleavage parallel to the basal plane $(111) = (0001)$, and most probably another parallel to the faces of the primitive rhombohedron $(100) = (0\bar{1}11)$; trechmannite exhibits a good cleavage parallel to the latter faces, and one less conspicuous parallel to the basal plane. Just as with trechmannite the faces of the forms $(100) = (0\bar{1}11)$ and $(\bar{1}01) = (1\bar{2}10)$ are well developed. The parallel hemihedrism is well shown in the zones $[010 : 001] = [10\bar{1}1 : \bar{1}101]$ and $[\bar{1}10 : 001] = [11\bar{2}0 : \bar{1}101]$. The

[1] L. Desbuissons, 'La Vallée de Binn (Valais),' Lausanne, 1909, p. 66: '5° Cristaux gris de plomb rhomboédriques. 111 : 100 = 38° 18′. Très petits et très modifiés.'

prism-zone is irregularly developed, many of the faces being absent, and this irregularity coupled with the parallel hemihedrism disguises the nature of the symmetry.

Altogether twenty-one forms were observed as under, of which all except the last six have been found on trechmannite:—c (111) = (0001), m ($\bar{2}11$) = (01$\bar{1}$0), $F\pi$ ($\bar{3}21$) = (14$\bar{5}$0), $d\pi$ ($\bar{7}25$) = (14$\bar{3}$0), a ($\bar{1}01$) = (12$\bar{1}$0), H (122) = (0$\bar{1}$15), e (011) = (01$\bar{1}$2), s ($\bar{1}11$) = (02$\bar{2}$1), r (100) = (0$\bar{1}$11), $a\pi$ (3$\bar{1}\bar{1}$) = (04$\bar{4}$1), $x\pi$ ($\bar{2}12$) = (14$\bar{3}$1), $V\pi$ ($\bar{5}31$) = (26$\bar{8}$1), $b\pi$ (2$\bar{1}$0) = (12$\bar{3}$1), $z\pi$ ($\bar{3}13$) = (26$\bar{4}$1), $p\pi$ (012) = (12$\bar{1}$3), $I\pi$ ($\bar{7}76$) = (1.13.$\bar{1}\bar{4}$.6), $P\pi$ ($\bar{3}50$) = (53$\bar{8}$2), $K\pi$ ($\bar{1}30$) = (31$\bar{4}$2), I ($\bar{1}40$) = (41$\bar{5}$3), $M\pi$ ($\bar{1}70$) = (71$\bar{8}$6), $N\pi$ ($\bar{5}32$) = (15$\bar{6}$2). There were also present some tiny faces, lying outside the measured zones, which were too minute for measurement on the goniometer. The observations are tabulated below.

Trechmannite, which is scarlet-vermilion in colour and has a streak of the same colour, contains sulphur, arsenic, and silver; the new mineral, on the other hand, is lead-grey in colour, and gives a chocolate-coloured streak, and probably therefore contains sulphur, arsenic, and lead. Since the two minerals are isomorphous, the new one may conveniently be termed trechmannite-α.

Measurements from ($\bar{1}10$) = (11$\bar{2}$0) in the zone with (110) = (1$\bar{1}$02):—

Form.	Calculated Values.	Measured Angles.
($\bar{3}50$) = (53$\bar{8}$2)	21° 28′	21° 33′
($\bar{1}20$) = (21$\bar{3}$1)	27 40	27 40, 27° 41′, 27° 44′
($\bar{1}30$) = (31$\bar{4}$2)	38 11	38 17, 38 28
($\bar{1}40$) = (41$\bar{5}$3)	44 9	44 9
($\bar{1}70$) = (71$\bar{8}$6)	49 3	50 14
(010) = (10$\bar{1}$1)	57 33	57 10, 57 33, 57 33, 57° 33′, 57° 37′
(120) = (2$\bar{1}\bar{1}$3)	78 2	76 30
(110) = (1$\bar{1}$02)	90 0	90 0
(210) = (12$\bar{1}$3)	101 58	100 36
(100) = (0$\bar{1}$11)	122 27	122 22, 122 37
(4$\bar{1}$0) = ($\bar{1}$453)	136 39½	136 36
(3$\bar{1}$0) = ($\bar{1}$342)	141 49	142 5
(1$\bar{1}$0) = ($\bar{1}\bar{1}$20)	180 0	180 0
(12$\bar{0}$) = (2$\bar{1}$3$\bar{1}$)	207 40	207 41
(13$\bar{0}$) = (3$\bar{1}$42)	218 11	216 15
(0$\bar{1}$0) = (101$\bar{1}$)	237 33	237 29
($\bar{1}\bar{1}$0) = ($\bar{1}$102)	270 0	270 0, 270 7
(3$\bar{1}$0) = ($\bar{1}$32$\bar{4}$)	287 38	287 41, 288 0
($\bar{1}$00) = (01$\bar{1}\bar{1}$)	302 27	302 22, 302 27, 302 27
($\bar{4}$10) = (14$\bar{5}$3)	316 39½	316 27, 316 29
($\bar{3}$10) = (13$\bar{4}$2)	321 49	322 15

Measurements from $(\bar{1}10) = (11\bar{2}0)$ in the zone with $(001) = (\bar{1}101)$:—

Form.	Calculated Values.	Measured Angles.
$(\bar{3}\bar{3}1) = (24\bar{6}1)$	17° 15½′	17° 57′
$(\bar{2}21) = (13\bar{4}1)$	24 59	24 56, 25° 3′
$(\bar{7}76) = (1.13.\bar{1}\bar{4}.6)$	38 37	38 40
$(\bar{1}11) = (02\bar{2}1)$	42 59	42 53, 42 54, 42° 55′, 42° 56′, 42° 57′, 43° 5′
$(\bar{1}12) = (\bar{1}3\bar{2}2)$	61 17	61 12, 61 36
$(001) = (\bar{1}101)$	90 0	89 52, 90 0, 90 0
$(1\bar{1}1) = (\bar{2}021)$	137 1	137 36
$(2\bar{2}1) = (3\bar{1}41)$	155 1	154 59
$(1\bar{1}0) = (\bar{1}\bar{1}20)$	180 0	180 0
$(\bar{1}12) = (3\bar{1}\bar{2}2)$	298 43	298 16, 298 16
$(\bar{1}1\bar{1}) = (20\bar{2}\bar{1})$	317 1	316 56, 317 4, 317 8
$(\bar{3}3\bar{2}) = (51\bar{6}\bar{2})$	328 9	328 12
$(\bar{2}2\bar{1}) = (31\bar{4}\bar{1})$	335 1	335 59
$(\bar{3}3\bar{1}) = (42\bar{6}\bar{1})$	342 44½	342 12, 344 56

Measurements from $(\bar{1}10) = (11\bar{2}0)$ in the zone with $(11\bar{1}) = (2\bar{2}01)$:—

Form.	Calculated Values.	Measured Angles.
$(\bar{1}3\bar{1}) = (40\bar{4}1)$	31° 21′	34° 8′, 34° 9′
$(02\bar{1}) = (3\bar{1}\bar{2}1)$	53 49	53 35, 53 35
$(11\bar{1}) = (2\bar{2}01)$	90 0	89 48

Measurements from $(\bar{1}10) = (11\bar{2}0)$ in the prism-zone:—

Form.	Calculated Values.	Measured Angles.
$(\bar{2}3\bar{1}) = (41\bar{5}0)$	21° 47′	22° 33′
$(\bar{1}2\bar{1}) = (10\bar{1}0)$	30 0	31 9
$(01\bar{1}) = (2\bar{1}\bar{1}0)$	60 0	59 57, 60° 3′
$(12\bar{3}) = (5\bar{4}\bar{1}0)$	81 47	81 47
$(25\bar{7}) = (43\bar{1}0)$	87 48	87 54
$(11\bar{2}) = (1\bar{1}00)$	120 0	120 5, 120 55
$(110) = (\bar{1}\bar{1}20)$	180 0	179 52
$(0\bar{1}1) = (\bar{2}110)$	240 0	240 56
$(\bar{1}01) = (\bar{1}2\bar{1}0)$	300 0	300 1

Measurements from $(\bar{1}10) = (11\bar{2}0)$ in the zone with $(111) = (0001)$:—

Form.	Calculated Values.	Measured Angles.
$(\bar{3}51) = (44\bar{8}3)$	28° 45′	28° 4′
$(\bar{1}31) = (22\bar{4}3)$	47 39	46 58
$(201) = (\bar{1}\bar{1}23)$	114 30	114 55
$(3\bar{1}1) = (\bar{2}\bar{2}43)$	132 21	132 53

Measurements from $(\bar{1}2\bar{1}) = (10\bar{1}0)$ in the zone with $(111) = (0001)$:—

Form.	Calculated Values.	Measured Angles.
$(010) = (10\bar{1}1)$	51° 42′	51° 29′, 51° 55′
$(111) = (0001)$	90 0	89 37, 90 1
$(101) = (\bar{1}012)$	111 32	111 32, 111 32

A Students' Goniometer.[1]

By G. F. Herbert Smith, M.A., D.Sc., F.G.S.
Assistant in the Mineral Department of the British Museum.

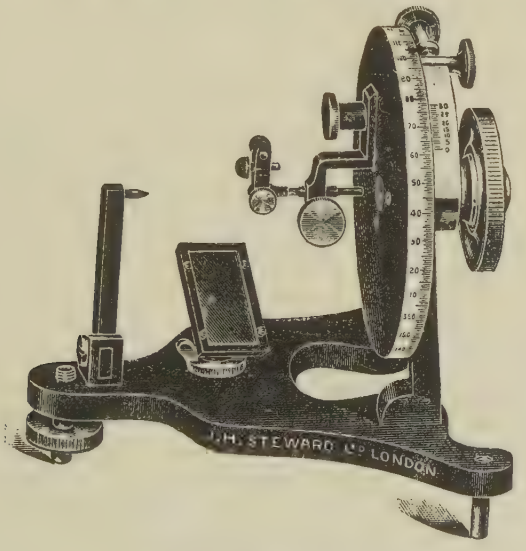
[Read March 18, 1919.]

THIS form of goniometer was designed in order to provide for the use of students of elementary crystallography, at as moderate a cost as possible, an efficient instrument for the measurement of the interfacial angles of crystals. It is of the customary type, in which the direction of reference is given by the reflection of a distant object in a small plane mirror without optical aid, and the axis of the graduated circle is horizontal. The mirror measures about 45 by 25 mm. and its frame is rigidly attached to the ball of a ball and socket joint, so that it is adjustable in any direction; the socket is split, and a screw linking the halves enables it to grip the ball firmly. The pillar carrying the socket passes through a split collar, slightly tapering in shape, which may be clamped by means of a butterfly-nut; when released, the mirror may be adjusted to the requisite distance from the axis of the graduated circle. The base stands on three legs, one of them being adjustable vertically, which are placed so as to assure complete stability of the instrument during use. The graduated circle, which is 5 inches (12·5 cm.) in diameter, is provided with a clamp and fine adjustment of the ordinary type. Its scale, which is silvered to facilitate the readings, is divided to half degrees, and is read by means of a vernier to minutes of arc.

The method of adjusting the crystal to be measured presents greater novelty. The crystal-holder itself is of the ordinary type, a small circular plate fixed to the top of a short, thin pin, which passes through a socket and can be clamped firmly by means of a screw. The short arm carrying the clamping-piece is hinged at its lower end, and can itself be firmly clamped by a screw forming the pin of the hinge. The co-ordination of these two motions in varying proportions suffices for the adjustment of an edge on the crystal parallel to the axis of the graduated circle, and enables the crystal, as regards one half of it, to be completely measured without re-adjustment on the wax, no small convenience if the crystal be small. The hinge referred to is attached to a horizontal pin passing through a split collar, which may be tightened by means of a screw.

[1] Communicated by permission of the Trustees of the British Museum.

This collar is carried on an arm, which is bent away from the plane surface of the graduated circle for convenience of access to the head of the screw operating it. The arm in turn is pivoted at a point on the flat face of the graduated circle about 3 cm. from its centre, and the central line of the collar and therefore also of the pin passing through it is of precisely the same length; consequently, rotation about the pivot carries the central line of the horizontal pin through the axis of the graduated circle. The arm may be fixed by means of a screw forming



A Students' Goniometer.

the pivot. To prevent the arm dropping on release of the screw owing to want of balance about the pivot, the screw bears on a small spring surrounding it, which is carried in a collar fixed to the arm; the friction is sufficient to keep the arm steady. This second pair of movements forms the means of adjusting the crystal into the line of axis of the graduated circle, while the lengthwise movement of the horizontal pin within its collar, when released, permits of the crystal to be set above the plane mirror. To facilitate this adjustment, a pointer (on the left in the figure) is provided; when not required, it can be swung out of the way, but is readily brought into position by turning its arm until it comes against the stop.

The instrument was constructed by Messrs. J. H. Steward, Ltd., 406 Strand, London, W.C. 2.

The crystallography of Vogtite, an anorthic metasilicate of iron, calcium, manganese, and magnesium, from acid steel-furnace slags.

By A. F. Hallimond, M.A., F.G.S.

Assistant Curator, Museum of Practical Geology, London.

[Read March 18, 1919.]

THE substance was met with in the course of work on steel-furnace slags, a general account of which has been communicated to the Iron and Steel Institute.[1] These slags were for the most part melts consisting principally of the three oxides FeO, MnO, and SiO_2, and yielded the silicates fayalite and rhodonite. The small amount of calcium silicate usually present is held in isomorphous solid solution in these silicates, but when the amount of lime exceeds about eight per cent. a new silicate appears, which does not seem to belong to any of the known mineral groups. A specimen was obtained from a slag of rather low silica content in which this substance had crystallized first in long blades radiating from the sides of the slag-ball; by the withdrawal of the mother-liquor, cavities had been formed which contained terminated crystals, and from these it has been possible to determine the crystallographic and optical properties of the material.

Analysis.—The two analyses quoted below are by Mr. J. H. Whiteley (loc. cit.). The silicate was separated magnetically after a slight roasting, and the ferric oxide is therefore to be treated as originally in the ferrous state. The amount of ferric oxide present in the slag itself is small and is mainly in the form of magnetite in the interstitial glass.

[1] 'The acid hearth and slag.' by J. H. Whiteley and A. F. Hallimond (read May 10, 1919).

	Slag.	Separated crystals.	Equivalent ratios.
SiO_2 ...	47·9	47·4	0·790
Al_2O_3 ...	1·72	0·15	
Fe_2O_3 ...	1·2	2·7	0·257
FeO ...	20·85	15·95	
MnO ...	10·8	12·95	0·182
CaO ...	13·0	15·1	0·270
MgO ...	3·89	5·26	0·131
TiO_2 ...	0·58	0·10	
Total ...	99·4	99·61	
Sp. gr. ...	...	3·39	

The composition approximates to the metasilicate ratio, and it is interesting to note that while the FeO has diminished in the crystals the other three basic oxides have slightly increased. The deviation from metasilicate ratio is rather greater than would be expected for the material analysed, and it seems possible that solution of non-isomorphous compounds may occur.

Optical properties.—When free from included glass the crystals are transparent and pale amber-yellow in colour. They show little or no pleochroism and have nearly straight extinction. On crushing, flakes on the two cleavages *M* and *m* are obtained, and in both an optic axis can be seen at a short distance from the centre of the field. The axial plane is nearly normal to the zone of elongation and the crystals are optically negative. By immersion in a mixture of monobromonaphthalene and methylene iodide the refractive index β was found to be 1·701 for sodium-light. On the Hutchinson universal apparatus, by immersion in the same liquid, the axial angle was measured as $2V_D = 65\frac{1}{2}°$. The optic axis, which is nearly normal to the cleavage *m*, shows but little dispersion, but that emerging through *M* is very noticeably coloured; the brush is displaced obliquely for blue light and the axial angle is less than that for yellow. A small flake was mounted on the stage goniometer and rotated in the mixture with refractive index equal to β. The position of the two optic axes having been observed, the flake was set so that the acute bisectrix was nearly coincident with the axis of the microscope. The extinction was found to be 5°. When the obtuse bisectrix was in the axis, the extinction was straight. These results, together with the extinction on *mM* in fully developed crystals, indicate that the position of the third mean line is that shown in the stereogram

(fig. 1); the acute and obtuse bisectrices lie very nearly in the equatorial plane in the positions shown.

Cross-sections of these crystals are almost impossible to prepare, but in a section of a closely similar slag from a Scottish steel-works it was found possible to measure the birefringence $\gamma - \alpha = 0{\cdot}018$.

Crystallography.—Four elongated crystals, of the habit shown in fig. 2 and about 2 mm. in width, were found to give moderately good readings. The observations on these are summarized in the following table:—

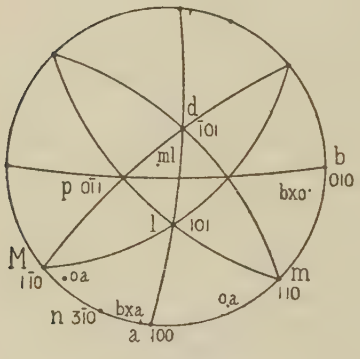


Fig. 1.—Stereographic projection of the crystal-forms of Vogtite.

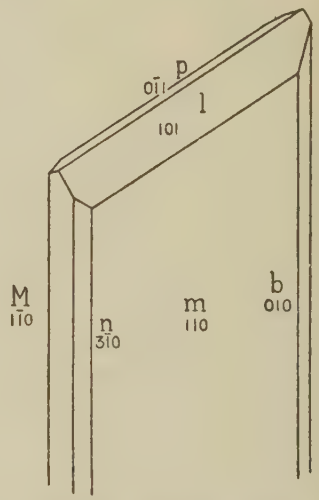


Fig. 2.—Crystal of Vogtite.

Angle.	*mb*	*m'M*	*mn*	*ml*	*m'p*	*m'M* (cleavage)	[*mM*]:[*mp*
No. of readings	4	4	1	2	3	1	4
Highest	44° 40′	84° 54′		60° 1′	75° 46′		62° 10′
Lowest	44 30	84 49		59 18	74 21		62 0
Mean	44 31½	84 50½	69° 53′	59 39½	75 30	85° 12′	62 6½
Calculated	*	*	69 34½	*	*	—	*

Anorthic, $a : b : c = 1{\cdot}093 : 1 : 0{\cdot}729$; $\alpha = 99° 37′$, $\beta = 99° 21′$, $\gamma = 83° 53′$.

Forms: $b\{010\}$, $m\{110\}$, $M\{1\bar{1}0\}$, $p\{0\bar{1}1\}$, $l\{101\}$, $n\{3\bar{1}0\}$.

The readings for the angle between the zones $[nM]$ and $[mp]$ were measured on the microscope, the faces l and p being unsuitable for the measurement of a cross-zone on the goniometer. The cleavages M and m are perfect; the cross-cleavage, if present at all, is very steep, and the flakes of the crushed crystals are extremely sharp.

A substance having the same angles as those here given has been described by C. Hlawatsch,[1] who proposed for it the name vogtite in honour of J. H. L. Vogt. The composition could not be ascertained and the source of the slag was not known. The cleavages given are not in accordance with those observed for the material now described, and there are minor differences in the physical properties, but the agreement between the angles is very close, and there is no doubt that the substances are members of the same isomorphous group. The crystals exhibit marked pseudo-tetragonal symmetry, and for this reason a setting has been chosen which differs from that of Hlawatsch. The following table shows the forms and angles in both settings:—

Forms.		Angles.			
Hlawatsch.	A. F. H.	Hlawatsch.		A. F. H.	
a (100)	*m (110)	$a:m$	50° 18·7′	$m:a$	50° 10½′
m (110)	a (100)	$a:M$	44 21·9	$m:b$	44 34½
*t (120)	[t (2$\bar{1}$0)]	$m:M$	94 40·6	$a:b$	94 45
*b (010)	*M (1$\bar{1}$0)	$a:b$	95 30	$m:M$	95 9½
*M (1$\bar{1}$0)	b (010)	$b:d$	64 47·3		—
e (0$\bar{1}$1)	p' (01$\bar{1}$)	$a:d$	81 10·2		—
d (011)	[d' (10$\bar{1}$)]	$b':e$	61 33·9		—
—	n (3$\bar{1}$0)	$a:e$	75 26·1	$m:p'$	75 30
—	l (101)	$[aM]:[ac]$	62 1	$[mb]:[mp]$	62 6½
			—	$m:l$	59 39½
			—	$a:l$	50 41

* cleavage-form.

It is probable that vogtite will prove to be the commonest silicate in those slags of the acid process to which lime has been added. No natural

[1] C. Hlawatsch, 'Eine trikline, rhodonitähnliche Schlacke.' Zeits. Kryst. Min., 1907, vol. xlii, pp. 590–593.

occurrence of the substance would seem to have been recorded,[1] but since the conditions of formation are very similar to those which yield rhodonite, the formation of this mineral also might be expected in a rock of suitable composition.

[1] Two anorthic minerals resembling rhodonite have recently been described, namely pyroxmangite (W. E. Ford and W. M. Bradley, Amer. Journ. Sci., 1913, ser. 4, vol. xxxvi, p. 169), and sobralite (J. Palmgren, Bull. Geol. Inst. Univ. Upsala, 1917, vol. xiv, p. 173). These are considerably denser than vogtite, and the optical schemes given by Palmgren have nothing in common with that for this substance.

Eighth list of new mineral names.[1]

By L. J. Spencer, M.A., F.G.S.

Assistant in the Mineral Department of the British Museum.

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Adamite. (Mineral Resources, U.S. Geol. Survey, for 1903, 1904, p. 1015; Thorpe's Dictionary of Applied Chemistry, 2nd edit., 1912, vol. i, p. 47; The Mineral Industry, New York, 1917, vol. xxv for 1916, p. 31). Trade-name for artificial corundum manufactured for abrasive purposes. Compare Alundum (fifth list) and Aloxite (seventh list). Not the Adamite of C. Friedel, 1866.

Ambatoarinite. A. Lacroix, 1916. Bull. Soc. franç. Min., vol. xxxviii (for 1915), p. 265. An orthorhombic carbonate of cerium metals and strontium, $5SrCO_3 . 4(Ce,La,Di)_2(CO_3)_3 . (Ce,La,Di)_2O_3$, occurring with celestite, monazite, felspar, &c., as a constituent of a crystalline limestone at Ambatoarina, Madagascar. Compare Ancylite (G. Flink, 1900; second list).

Amosite. A. L. Hall, 1918. Geol. Survey S. Africa, Mem. No. 12, p. 20 et seq.; Trans. Geol. Soc. S. Africa, 1919, vol. xxi, p. 8. A monoclinic amphibole-asbestos rich in iron (FeO 32–44 per cent.) sometimes

[1] Previous lists of this series have been given at the ends of vols. xi–xvii (1897–1916) of this Magazine. A few older names, not given in Dana (System of Mineralogy, 6th edit., 1892) or Chester (Dictionary of the names of minerals, 1896), are also included.

A long list of names of gem-minerals has recently been published by W. T. Schaller ('Gems and precious stones in 1917.' Mineral Resources, United States Geol. Survey, for 1917, 1918, part II, pp. 147–168). Many of these are quite trivial and have been introduced solely for trade purposes. Only a selection of them, for which bibliographical references could be traced, are included in the present list. One is inclined to deal with such names in the manner of Adam Littleton, who in the preface to his 'Latine Dictionary' (London, 1678) writes: 'As to the Chymical terms of Paracelsus, (which have formerly pestered Latinity) and other strange words used by men of his Tribe, which have no affinity with Latine or Greek, they are wholly omitted, and not so much as set down amongst the Barbarous.'

containing sodium, and near to cummingtonite and grünerite in composition. Material of commercial quality occurs in large amount over a wide area in the Lydenburg and Pietersburg districts, Transvaal. Named from the Amosa asbestos mine, this word being formed of the initial letters of the company 'Asbestos Mines of South Africa'.

Apricotine. (D. B. Sterrett, Mineral Resources, U.S. Geol. Survey, for 1909, 1911, part ii, p. 802; W. T. Schaller, ibid., for 1917, 1918, part ii, p. 148.) Trade-name for yellowish-red, apricot-coloured quartz pebbles from near Cape May, New Jersey, used as gem-stones.

Arsenobismite. A. H. Means, 1916. Amer. Journ. Sci., ser. 4, vol. xli, p. 127 (Arseno-Bismite). A hydrated bismuth arsenate, $2Bi_2O_3.As_2O_5.2H_2O$, forming yellowish-green crystalline aggregates in a mixed friable ore from the Mammoth mine, Tintic district, Utah. This formula is deduced from a very unsatisfactory analysis, and the characters as given are not sufficient to distinguish the supposed new mineral from atelestite and rhagite. The name, which is suggested by the chemical composition, is not intended to imply an arsenical variety of bismite.

Auxite. E. W. Hilgard, 1916. Proc. National Acad. Sci. U.S.A., vol. ii, p. 11. A name suggested, but discarded in favour of Lucianite (q. v.). From *αὔξω*, to increase.

Bariohitchcockite. E. T. Wherry, 1916. Proc. U.S. Nat. Museum, vol. li, p. 83. Taking the name hitchcockite (C. U. Shepard, 1856) [= plumbogummite] for the group-name of the isomorphous series of minerals with the general formula $R'_2O.3Al_2O_3.2P_2O_5.8H_2O = R'_2H_4[Al(OH)_2]_6(PO_4)_4$, the several end-members become: when $R' = \frac{1}{2}Ba$, bariohitchcockite (= gorceixite); when $R' = \frac{1}{2}Sr$, strontiohitchcockite (= hamlinite = goyazite); when $R' = K$, kaliohitchcockite; and when $R' = Na$, natrohitchcockite. The last two of these salts have been met with in only small proportions in isomorphous mixtures.

Basobismutite. K. A. Nenadkevich, 1917. Bull. Acad. Sci. Pétrograd, ser. 6, vol. xi (1), p. 454 (базобисмутить). A basic bismuth carbonate, $2Bi_2O_3.CO_2.H_2O$, from Transbaikal, Siberia.

Belgite. R. Panebianco, 1916. Riv. Min. Crist. Italiana, vol. xlvii, p. 13 (Belgito). Synonym of willemite (Zn_2SiO_4), which was named by A. Lévy in 1830 after William I (1772–1844), king of the Netherlands. Writing in Esperanto, the author objects to naming minerals after kings,

preferring a name derived from the locality. He, however, overlooks the fact that this mineral is not from Belgium, but from the neutral state of Moresnet.

Brazilite.

(1) Used commercially since about 1884 for an oil-bearing rock from Bahia (L. Fletcher, Mineralogical Magazine, 1893, vol. x, p. 160).

(2) E. Hussak, 1892 (first list), synonym of baddeleyite, monoclinic zirconia, ZrO_2.

(3) Used commercially since about 1916 for the fibrous, mamillated form of zirconia, which is perhaps distinct from baddeleyite (H. C. Meyer, Mineral Foote-Notes, Philadelphia, March 1917, p. 2; W. T. Schaller, ibid., March 1918, p. 2; E. H. Rodd, Journ. Soc. Chem. Industry, 1918, vol. xxxvii, p. 213 R). *See* Caldasite and Zirkite.

Caldasite. O. A. Derby in T. H. Lee, 1917. Revista Soc. Brasileira Sci., No. 1, p. 31; Amer. Journ. Sci., 1919, vol. xlvii, p. 126. Zirconia-ore or rock consisting mainly of baddeleyite or of a mixture of zircon and norvillite (q. v.), from the Caldas district, Minas Geraes, Brazil. *See* Zirkite.

Carbonate-apatite. R. Brauns, 1916. Neues Jahrb. Min., Beilage-Band xli, pp. 60, 73 (Carbonatapatit). A member of the apatite group with the composition $3Ca_3P_2O_8 . CaCO_3$. The same as carbapatite (P. N. Chirvinsky, 1906; fourth list: = podolite = dahllite). Crystals from the Laacher See district, Rhine, are, however, said to differ from these in having an optically *positive* biaxial shell surrounding an optically negative uniaxial nucleus. *See* Sulphate-apatite.

Carbonate-sodalite. R. Brauns, 1916. Neues Jahrb. Min., Beilage-Band xli, p. 73 (Carbonatsodalith). A hypothetical molecule assumed to explain the presence of carbonic acid (CO_2 1·27 per cent., together with Cl 1·08 and SO_3 7·97) in noselite from the Laacher See, Rhine.

Catoptrite. *See* Katoptrite.

Celedonite. M. F. Heddle, The Mineralogy of Scotland, Edinburgh, 1901, vol. i, p. 60; vol. ii, p. 145. An incorrect spelling of Celadonite.

Cerulene. (Review of Mining Operations, South Australia, for 1910, 1911, No. 13, p. 9.) Trade-name for a form of calcium carbonate coloured green and blue by malachite and chessylite; found near Bimbowrie, South Australia, and used as a gem-stone. Named from the Latin, *caeruleus*, sky-blue.

Chubutite. H. Corti, 1918. Anal. Soc. Quim. Argentina, vol. vi, p. 65; E. Rimann, ibid., p. 323 (Chubutita). A reddish-yellow, tetragonal (?) oxychloride of lead, $7PbO.PbCl_2$, from Chubut, Argentina. Evidently identical with Lorettoite (q. v.).

Clarain. M. C. Stopes, 1919. *See* Fusain.

Cochranite. J. E. Stead, 1918. Journ. Iron and Steel Inst., vol. xcvii, p. 171. Artificially-produced titanium dicyanide, $Ti(CN)_2$, found as minute, dark-blue cubes in blast-furnace 'bears'. It was first found in quantity by Mr. Alfred O Cochrane at the iron-works of Messrs. Cochrane & Co., at Ormesby near Middlesborough.

It is formed under the same conditions, and sometimes together with, the copper-red cubes of titanium cyano-nitride, $Ti(CN)_2.3Ti_3N_2$. This was named *sorbite* (after Henry Clifton Sorby, 1826–1908) by H. M. Howe (1890), a term afterwards withdrawn, as the same name was given by F. Osmond (1895) for one of the transition conditions in carbon-steel. A sugar also bears the name sorbite (from Lat. *Sorbus*, the service-tree).

Colerainite. E. Poitevin and R. P. D. Graham, 1918. Canada, Geol. Survey, Museum Bulletin, No. 27, p. 66; E. Poitevin, Trans. Roy. Soc. Canada, 1918, ser. 3, vol. xii, sect. iv and v, p. 37. Hydrated silicate of magnesium and aluminium, $4MgO.Al_2O_3.2SiO_2.5H_2O$, forming colourless, thin, hexagonal (optically uniaxial) crystals which are usually aggregated in white rosettes or botryoidal forms; occurs as veins in serpentine. Named from the locality, Coleraine township, Megantic Co., Quebec.

Collbranite. D. F. Higgins, 1918. Economic Geology, vol. xiii, p. 19. A black acicular mineral forming stellar aggregates in crystalline limestone in the Suan mining district, central Korea. It was identified by B. Kotô (1910) as ilvaite; the microscopical characters, however, suggest a highly ferriferous pyroxene of the hedenbergite type, possibly near $FeSiO_3$, but no analysis is given. Named after Mr. H. Collbran and his son A. H. Collbran, of the Suan mine.

Cornetite. H. Buttgenbach, 1916. Les Minéraux et les Roches, Liège, p 452 (Cornètite), p. 521 (cornétite). Described, but without name, by G. Cesàro, Annales Soc. Géol. Belgique, 1912, vol. xxxix, Bull. p. 241; Annexe to vol. xxxix (Publ. relatives au Congo Belge), p. 41. Phosphate of copper and cobalt occurring as small, blue, orthorhombic crystals in l'Étoile du Congo copper mine, Katanga, Belgian Congo. Named after the Belgian geologist Jules Cornet.

Cornuite. A. F. Rogers, 1917. Journ. Geol. Chicago, vol. xxv, p. 537. A glassy, green or bluish-green copper silicate, $mCuO \cdot nSiO_2 \cdot xH_2O$, the amorphous equivalent of chrysocolla (of which microcrystalline and crystallized material is known). Named in memory of Dr. Felix Cornu (1882–1909), who wrote on colloidal minerals.

Crandallite. G. F. Loughlin and W. T. Schaller, 1917. Amer. Journ. Sci., ser. 4, vol. xliii, p. 69. A hydrated phosphate of calcium and aluminium, $CaO \cdot 2Al_2O_3 \cdot P_2O_5 \cdot 5H_2O$, forming compact, greyish masses with fibrous structure and probably resulting from the alteration of goyazite. From the Tintic district, Utah. Named after Mr. M. L. Crandall, mining engineer of Provo, Utah.

Creedite. E. S. Larsen and R. C. Wells, 1916. Proc. Nat. Acad. Sci. U.S.A., vol. ii, p. 362. Hydrated fluoride and sulphate of calcium and aluminium, $2CaF_2 \cdot 2Al(F,OH)_3 \cdot CaSO_4 \cdot 2H_2O$, the formula being the same as that of gearksutite (with which the new mineral occurs) with the addition of $CaSO_4$. The cleavages and optical characters point to monoclinic symmetry. Occurs as white to colourless grains embedded in kaolinite near Wagon Wheel Gap, Colorado. This locality lies near the centre of the Creede quadrangle of the United States Geological Survey; hence the name.

Crestmoreite. A. S. Eakle, Bull. Dep. Geol. Univ. California, vol. x, p. 344. Hydrated calcium silicate, perhaps $CaSiO_3 \cdot H_2O$, occurring as compact, snow-white masses as an alteration product of wilkeite (7th list) in blue calcite at Crestmore, Riverside Co., California. Named after the locality.

Crystolon. (The Mineral Industry, New York, 1913, vol. xxi, for 1912, p. 774. Mineral Resources, U.S. Geol. Survey, for 1914, 1915, part ii, p. 568.) Trade-name for an artificially-produced crystalline carbide of silicon, CSi, used for abrasive purposes. *See* Carborundum (fourth list).

Deodatite. K. W. Nose, 1790. Orographische Briefe über das Siebengebirge (Niederrheinische Reise), Frankfurt am Mayn, 1790, part 2, p. 198; Beschreibung einer Sammlung von meist vulkanischen Fossilien die Deodat-Dolomieu im Jahre 1791 von Maltha aus . . . versandt, Frankfurt a. M., 1797, pp. 27, 43, 80; Revision des Beschlusses der Kritik über die Theorie der Geologie, Bonn, 1835, p. 7. A bluish mineral found in the trass of the Lower Rhenish district, at first regarded as perhaps the same as prehnite, and by some authors referred to

pleonaste or haüyne (J. R. Zappe, Mineralogisches Hand-Lexicon, Wien, 1817, vol. i, p. 257). In 1797 Nose, apparently extending the use of the name to other substances, considered deodatite to be identical with pitchstone, at the same time changing the name to *dolomian*. Both names, now obsolete, are after Déodat G. S. T. G. de Dolomieu (1750–1801).

Doelterite. A. Lacroix, 1913. Nouv. Arch. Muséum Hist. Nat. Paris, ser. 5, vol. v, p. 334 (dœltérites). The titanium dioxide commonly shown in analyses of laterites is presumably present in a hydrated colloidal form: when soluble in hydrochloric acid it is perhaps the ortho-titanic acid H_4TiO_4, or, when soluble only in sulphuric acid, the meta-titanic acid H_2TiO_3. This constituent of laterite is not visibly recognizable even under the microscope. Named after Professor Cornelius August Doelter y Cisterich, of Vienna. Compare Paredrite.

Durain. M. C. Stopes, 1919. *See* Fusain.

Eakleite. E. S. Larsen, 1917. Amer. Journ. Sci., ser. 4, vol. xliii, p. 464. A pale pink, fibrous mineral from California resembling pectolite in appearance and perhaps a calcium pectolite, $5CaO . 5SiO_2 . H_2O$. Named after Professor Arthur Starr Eakle, of the University of California.

Ectropite. *See* Ektropite.

Eisenanthophyllit. *See* Iron-anthophyllite.

Ektropite. G. Flink, 1917. Geol. För. Förh., vol. xxxix, p. 426 (Ektropit). Abstracts in Amer. Journ. Sci., 1917, vol. xliv, p. 484, and Amer. Min., 1917, vol. ii, p. 128 give the spelling Ectropite. Hydrated silicate of manganese, with some magnesium, ferrous iron, and calcium, $12RO . 8SiO_2 . 7H_2O$, forming small, brown, monoclinic crystals of tabular rectangular habit. Occurs with garnet in magnetite in the Norrbotten iron mine at Långban, Sweden. Named from ἐκτροπή, a turning aside, an evasion, on account of the difficulty experienced in determining the characters.

El Doradoite. S. L. Watkins, 1912. [Los Angeles Mining Review, January 13, 1912]; American Mineralogist, 1917, vol. ii, p. 26. Trade-name for a blue variety of quartz used as a gem-stone; from El Dorado Co., California. W. T. Schaller (Mineral Resources, U.S. Geol. Survey, for 1917, 1918, part ii, p. 153) spells the name Eldoradoite, and states it to be iridescent quartz.

Ferrierite. R. P. D. Graham, 1918. Trans. Roy. Soc. Canada, ser. 3, vol. xii, sect. iv and v, p. 185. A zeolitic mineral forming spherical

aggregates of white, pearly, orthorhombic blades, occurring with chalcedony and calcite in basalt at Kamloops Lake, British Columbia. Chemically, it is related to ptilolite and mordenite, but with magnesium in place of calcium, the formula being $(Mg,Na_2,H_2)_4Al_2(Si_2O_5)_5 \cdot 6H_2O$. Named after Dr. Walter F. Ferrier, of Ottawa, who discovered the mineral.

Ferroludwigite. B. S. Butler and W. T. Schaller, 1917. *See* Magnesioludwigite.

Flokite. K. Callisen, 1917. Meddelelser Dansk Geol. For., vol. v, No. 9; Contributions to Mineralogy, Min. Geol. Museum Univ. Copenhagen, No. 16 (Flokit). A zeolite from Iceland, hitherto regarded as mesolite, forming slender, water-clear or pale yellowish-green, flattened, monoclinic crystals, with the composition $H_8(Ca,Na_2)Al_2Si_9O_{26} \cdot 2H_2O$. Named after the viking, Floki Vilgerðarson.

Fornacite. A. Lacroix, 1916. Bull. Soc. franç. Min., vol. xxxix, p. 84. The correct form of Furnacite (A. Lacroix, 1915; compare seventh list), from the Latin *fornax*.

Framesite. (J. R. Sutton, Trans. Roy. Soc. South Africa, 1918, vol. vii, pp. 75, 95; Chem. News, 1919, vol. cxviii, pp. 39, 66.) A form of black diamond (bort) from South Africa. Material collected by Mr. P. Ross Frames at the Premier diamond mine, Transvaal, was described in detail by D. P. McDonald, Trans. Geol. Soc. South Africa, 1914, vol. xvi, p. 156.

Fusain. (C. Grand'Eury, Ann. des Mines, 1882, ser. 8, vol. i, Mém., p. 106; A. Lacroix, Minéralogie de la France, 1910, vol. iv, p. 651.) A name used by French geologists for a constituent of coal known as 'mineral charcoal' (Ger. Faserkohle). The name, from the Latin *fusus*, a spindle, is applied in French to the spindle-tree, to charcoal (especially that made from the wood of the spindle-tree), to charcoal crayons, and, lastly, to charcoal sketches.

Other visible constituents of banded bituminous coal are distinguished by their external characters and named by M. C. Stopes, Proc. Roy. Soc. London, 1919, ser. B, vol. xc, p. 472: *Durain*, dull, hard coal (Ger. Mattkohle); from the Latin *durus*, hard. *Clairain*, bright or glance coal (Ger. Glanzkohle); from the Latin *clarus*, bright. *Vitrain*, similar to the last, with conchoidal fracture and brilliant appearance; from the Latin *vitreus*, glassy, with the same termination as fusain in each case. The chemical characters of these materials have been determined by

F. V. Tideswell and R. V. Wheeler, Journ. Chem. Soc. London, 1919, Trans. vol. cxv, p. 619.

Geldiadochite, Gelfischerite, Gelpyrophyllite, Gelvariscite. F. Cornu, 1909. Zeits. Chem. Indust. Kolloide, vol. iv, p. 17 (Geldiadochit, Gelfischerit, Gel-Pyrophyllit, Gelvariscit); Zeits. prakt. Geol., 1909, vol. xvii, pp. 84, 144; Centralblatt Min., 1909, p. 330. A. F. Rogers, Journ. Geol. Chicago, 1917, vol. xxv, p. 522. The gel-forms equivalent to the crystalloid forms diadochite, &c. *See* Uhligite.

Gelfischerite.
Gelpyrophyllite. } F. Cornu, 1909. *See* Geldiadochite.
Gelvariscite.

Geraesite. O. C. Farrington, 1912. Bull. Geol. Soc. America, vol. xxiii, p. 728. A preliminary abstract states this to be 'a hydrous barium aluminium phosphate more acidic than gorceixite', as the result of an analysis of a pebble ('fava') from the diamond washings of Minas Geraes, Brazil. Named after the locality. In the complete account (Amer. Journ. Sci., 1916, ser. 4, vol. xli, p. 356) the name does not appear, the material being evidently impure gorceixite.

Gilpinite. E. S. Larsen and G. V. Brown, 1917. American Mineralogist, vol. ii, p. 75. Hydrated sulphate of uranium with some copper, ferrous iron, &c., $RO . UO_3 . SO_3 . 4H_2O$, occurring as minute, monoclinic laths on pitchblende from Gilpin County, Colorado. Differs from zippeite and uranopilite in its optical characters. Named after the locality.

Griffithite. E. S. Larsen and G. Steiger, 1917. Journ. Washington Acad. Sci., vol. vii, p. 11. A member of the chlorite group occurring as a filling in amygdaloidal cavities in basalt, and differing both optically and chemically from any chlorite previously described. Formula, $4(Mg,Fe,Ca)O . (Al,Fe)_2O_3 . 5SiO_2 . 7H_2O$. Named after the locality, Griffith Park, Los Angeles, California.

Hematogelite. (A. F. Rogers, Journ. Geol. Chicago, 1917, vol. xxv, pp. 523, 528.) An alternative spelling of Haematogelite, Hämatogelit (F. Tućan, 1913; sixth list).

Hibbenite. A. H. Phillips, 1916. Amer. Journ. Sci., ser. 4, vol. xlii, p. 276. A basic zinc phosphate identical in crystalline form, cleavage, and optical properties (so far as determined) with hopeite, occurring in intimate association with spencerite (q.v.) from Salmo in British Columbia. The formula, given as $2Zn_3(PO_4)_2 . Zn(OH)_2 . 6\frac{1}{2}H_2O$, suggests that the

material analysed was a mixture of hopeite [$Zn_3(PO_4)_2 . 4H_2O$] and spencerite [$Zn_3(PO_4)_2 . Zn(OH)_2 . 3H_2O$]. Named after Dr. John Grier Hibben, President of Princeton University. Hopeite from this locality was subsequently independently described by T. L. Walker (Journ. Washington Acad. Sci., 1916, vol. vi, p. 685).

Högbomite. A. Gavelin, 1916. Bull. Geol. Inst. Univ. Upsala, vol. xv, p. 289 (Högbomit). Abstract in American Mineralogist, 1919, vol. iv, p. 76, gives the spelling Hoegbomite. A black, rhombohedral mineral occurring intimately intermixed with magnetite, ilmenite, and pleonaste in the iron-ores of Swedish Lapland. It resembles haematite in its physical characters, but approximates to pleonaste (iron-magnesia-spinel) in composition, $MgO . 2(Al_2O_3,Fe_2O_3,TiO_2)$. Named after Professor Arvid Gustaf Högbom, of Upsala.

Hydro-wollastonite. A. S. Eakle, 1917. Bull. Dep. Geol. Univ. California, vol. x, p. 348. A general term for the hydrated calcium metasilicates crestmoreite and riversideite (qq. v.).

Iolanthite. (D. B. Sterrett, Gems and precious stones in 1914, Mineral Resources, U.S. Geol. Survey, for 1914, 1915, part II, p. 323; W. T. Schaller, ibid., for 1917, 1918, part II, p. 155). Trade-name for a jasper-like mineral from Crooked River, Crook Co., Oregon, placed on the gem market by Mr. Don Maguire.

Iron-anthophyllite. C. H. Warren, 1903. Amer. Journ. Sci., ser. 4, vol. xvi, p. 341 (iron anthophyllite). An orthorhombic iron amphibole, $FeSiO_3$, found with fayalite at Rockport, Massachusetts; and later described and analysed (FeO 42·34 per cent.) from the rock eulysite at Tunaberg, Sweden (J. Palmgren, Bull. Geol. Inst. Univ. Upsala, 1917, vol. xiv, p. 133 (Eisenanthophyllit)).

Iron-sarcolite. W. T. Schaller, 1916. *See* Soda-sarcolite.

Kaliägirin. P. Niggli, 1913. Zeits. Anorg. Chem., vol. lxxxiv, p. 42. Artificially prepared potassium ferric metasilicate, $KFe'''(SiO_3)_2$, analogous to aegirite with potassium in place of sodium.

Kalioalunite. E. T. Wherry, 1916. Proc. U.S. Nat. Museum, vol. li, p. 82 (kalio-alunite), p. 83 (kalioalunite). Synonym of alunite. The potassium (kalium) end-member of the alunite isomorphous group $R_2'[Al(OH)_2]_6(SO_4)_4$, the sodium end-member being natroalunite (W. F. Hillebrand and S. L. Penfield, 1902; third list).

Kaliohitchcockite. E. T. Wherry, 1916. *See* Bariohitchcockite.

Katoptrite. G. Flink, 1917. Geol. För. Förh., vol. xxxix, p. 431 (Katoptrit). Abstracts in Amer. Journ. Sci., 1917, vol. xliv, p. 484, and Amer. Min., 1917, vol. ii, p. 129, give the spelling Catoptrite. Silico-antimonate of manganese, aluminium, &c.,

$$14(Mn,Mg,Fe)O \cdot 2(Al,Fe)_2O_3 \cdot Sb_2O_5 \cdot 2SiO_2,$$

forming monoclinic crystals with black colour and metallic lustre. There is a highly perfect cleavage parallel to the orthopinacoid. Occurs with magnetite in granular limestone at Nordmark, Sweden. Named from *κάτοπτρον*, a mirror, because of the brilliant lustre on the cleavage surface.

Leifite. O. B. Bøggild, 1915. Meddelelser om Grønland, vol. li, p. 427 (Leifit). A highly acidic fluo-silicate of sodium and aluminium, $Na_2Al_2Si_9O_{22} \cdot 2NaF$ or $Na_4(AlF)_2Si_9O_{22}$, occurring as colourless hexagonal prisms in the drusy alkali-pegmatite veins at Narsarsuk, Greenland. Named after the Scandinavian explorer Leif Ericsson (fl. 1000 A. D.).

Lithargite. E. T. Wherry, 1917. American Mineralogist, vol. ii, p. 19. The yellow, orthorhombic modification of lead monoxide, PbO, recognized as a mineral species from Austria and California by E. S. Larsen (ibid., p. 18), as distinct from the red, tetragonal modification called massicot or massicotite. The old name litharge with the mineralogical termination *ite*.

Lorettoite. R. C. Wells and E. S. Larsen, 1916. Journ. Washington Acad. Sci., vol. vi, p. 669. An oxychloride of lead, approximating to $6PbO \cdot PbCl_2$, forming honey-yellow, bladed masses with perfect basal cleavage and probably tetragonal. Named after the locality, Loretto Tennessee. Compare Chubutite.

Lucianite. E. W. Hilgard, 1916. Proc. National Acad. Sci. U.S.A. vol. ii, p. 11. A clayey material consisting mainly of a colloidal hydrated magnesium silicate, which swells up to many times its original volume when immersed in water. Named from the locality, the hacienda Santa Lucia, near the City of Mexico. A. F. Rogers (Journ. Geol. Chicago 1917, vol. xxv, p. 537) suggests that it is identical with stevensite, which he regards as the amorphous equivalent of talc. *See* Auxite.

Lusitanite. [T. L. Walker, 1916.] Summary Report, Geol. Survey Dept. Mines, Canada, for 1916, 1917, p. 306. Named in memory of the disaster to the steamship *Lusitania*, but later withdrawn. Synonym of spencerite (q. v.).

The same name was applied by A. Lacroix (Compt. Rend. Acad. Sc

Paris, 1916, vol. clxiii, p. 283) to an igneous rock—a mesocrate form of riebeckite-syenite—from Portugal, being named after the locality, Lusitania, a Roman province in the Iberian Peninsula.

Mackensite. F. Kretschmer, 1918. Neues Jahrb. Min., 1918, pp. 19, 23 (Mackensit (Schwarzeisenerz)); Archiv f. Lagerstätten-forschung, Berlin. A chloritic mineral approximating in composition to the hydrated ferric silicate, $Fe_2O_3 . SiO_2 . 2H_2O$, which is regarded as an end-member of the thuringite series. It occurs as iron-black to greenish-black compact masses in diabase and schalstein in northern Moravia and southern Silesia, where with thuringite, moravite (F. Kretschmer, 1906), and viridite (q. v.), it is mined as an ore of iron. The optical characters of the minute needles indicate monoclinic symmetry. Named after the German Field-Marshal, August von Mackensen.

Magnesioludwigite. B. S. Butler and W. T. Schaller, 1917. Journ. Washington Acad. Sci., vol. vii, p. 29. An ivy-green variety of ludwigite from Utah in which ferrous iron is largely replaced by magnesia, the formula being $MgO . Fe_2O_3 . 3MgO . B_2O_3$ with only about 15 per cent. of the corresponding ferrous compound *ferroludwigite* ($FeO . Fe_2O_3 . 3MgO . B_2O_3$).

Manganalmandine. J. Palmgren, 1917. Bull. Geol. Inst. Univ. Upsala, vol. xiv, p. 171 (Manganalmandin). A manganiferous garnet containing MnO 11·04, FeO 23·48, Al_2O_3 19·37 per cent., and thus intermediate between almandine and spessartite in composition.

Manganfayalite. C. Hintze, 1897. Handbuch der Mineralogie, vol. ii, p. 27 (Manganfayalit). A member of the olivine group between fayalite and knebelite in chemical composition. The name was first applied to an artificial product from a furnace slag; and later (J. Palmgren, Bull. Geol. Inst. Univ. Upsala, 1917, vol. xiv, p. 116) to a mineral from Sweden containing MnO 5–26·5 per cent., and with characters more like those of fayalite than knebelite.

Margarosanite. W. E. Ford and W. M. Bradley, 1916. Amer. Journ. Sci., ser. 4, vol. xlii, p. 159. A metasilicate of lead and calcium (with a little manganese replacing calcium), $PbCa_2(SiO_3)_3$, occurring at Franklin, New Jersey, as colourless and transparent lamellar masses with three good cleavages, the lustre being pearly on the best lamellar cleavage. Named from *μαργᾰρίτης*, a pearl, and *σᾰνίς*, a board, in reference to the pearly lustre and lamellar structure. Triclinic crystals and large masses of the same mineral were afterwards found at Långban, Sweden (G. Flink, Geol. För. Förh., 1917, vol. xxxix, p. 438).

Merrillite. E. T. Wherry, 1917. American Mineralogist, vol. ii, p. 119. A calcium phosphate belonging to the apatite group occurring in meteoric stones and identified by G. P. Merrill (Amer. Journ. Sci., 1917, ser. 4, vol. xliii, p. 322) as francolite, from which, however, it differs somewhat in its optical characters. Named after Dr. George Perkins Merrill, of the United States National Museum, Washington.

Minasite. O. C. Farrington, 1912. Bull. Geol. Soc. America, vol. xxiii, p. 728. Analysis of a pebble ('fava') from the diamond washings of Minas Geraes, Brazil, gave results suggesting at first a new aluminium hydroxide, $2Al_2O_3 . 3H_2O$. In the complete account (Amer. Journ. Sci., 1916, ser. 4, vol. xli, p. 360) this name is omitted and the material admitted to be impure. W. E. Ford (Amer. Journ. Sci., 1916, ser. 4, vol. xli, p. 569) incorrectly describes it as a hydrous aluminium phosphate. *See also* Geraesite. The two names from the locality Minas Geraes.

Mullanite. E. V. Shannon, 1918. Amer. Journ. Sci., ser. 4, vol. xlv, p. 66. A sulphantimonite of lead, $5PbS . 2Sb_2S_3$ (corresponding with the silver-lead diaphorite), occurring as acicular (orthorhombic ?) crystals and felted masses near Mullan in Idaho, and in western Montana. Named after Captain John Mullan, a pioneer road-maker in this region.

Natrohitchcockite. E. T. Wherry, 1916. *See* Bariohitchcockite.

Oliveiraite. T. H. Lee, 1917. Revista Soc. Brasileira Sci., No. 1, p. 31; Amer. Journ. Sci., 1919, vol. xlvii, p. 126; Chem. News, 1919, vol. cxviii, p. 125. Hydrated titanate of zirconium, $3ZrO_2 . 2TiO_2 . 2H_2O$, occurring as greenish-yellow, radially-fibrous masses with euxenite in Brazil. Named after the Brazilian geologist Dr. Francisco de Paula Oliveira.

Oruetite. S. Piña de Rubies, 1919. Anal. Soc. Española Fís. Quím., vol. xvii, p. 83 (Oruetita). A bismuth sulphotelluride, Bi_3TeS_4, occurring in the Serranía de Ronda, Spain, as brilliant steel-grey lamellar masses very like tetradymite in appearance. All the naturally occurring bismuth sulphotellurides (tetradymite, joseite, grünlingite, and ornetite) are regarded as eutectic mixtures of $Bi_2Te_3 . Bi_2S_3$ with Bi_2Te_3 and Bi_2S_3 and bismuth. Named after Domingo de Orueta, who collected the material.

Orvillite. T. H. Lee, 1917. Revista Soc. Brasileira Sci., No. 1, p. 31; Amer. Journ. Sci., 1919, vol. xlvii. p. 126; Chem. News, 1919, vol. cxviii, p. 125. Hydrated zirconium silicate, $8ZrO_2 . 6SiO_2 . 5H_2O$, occurring

with zircon in one variety of the zirconia-ore (*see* Caldasite and Zirkite) of the Caldas district, Brazil. It is evidently an altered zircon similar to those already described under various names. Named after Orville A. Derby (1851–1915), formerly director of the Geological Survey of Brazil.

Osmite. V. I. Vernadsky, 1909. Opuit Opisatelnoĭ Mineralogii, St. Petersburg, vol. i, pp. 248, 249 (Осмить); translation in Mining Journ. London, 1912, vol. xcviii, p. 851. Native osmium, perhaps present amongst the grains of crude iridosmine from Brazil and the Urals. In the Supplement, 1914, p. 752, the name is applied to an iridosmine from Borneo containing Os 80, Ir 10, Rh 5 per cent.

Paredrite. O. C. Farrington, 1916. Amer. Journ. Sci., ser. 4, vol. xli, p. 356. A black, compact form of titanium dioxide differing from rutile in containing a little water, 0·6 per cent. [not sufficient, however, to form a hydrate, and no doubt present as an impurity]. Named from *πάρεδρος*, an associate, on account of its association as 'favas' (bean-shaped pebbles) with the diamonds of Brazil. Compare Doelterite.

Pelinite. A. B. Searle, 1912. The Natural History of Clay, Cambridge Manuals of Science and Literature, 1912, pp. 83, 148, 149. An unidentified hydrated aluminium silicate, which is highly plastic and partly colloidal. The essential clay substance of the widely distributed, secondary (i.e. transported from their place of origin) plastic clays. The term is analogous to the term clayite (J. W. Mellor, 1909; 5th list), which is here restricted to the corresponding essential constituent of the less plastic, primary (i.e. not transported) clays, such as china-clay (kaolin). Named from *πήλϊνος*, made of clay.

Psilomelanite. (T. Egleston, Catalogue of Minerals and Synonyms, Bull. U.S. Nat. Mus., 1887 (1889), No. 33, p. 137. E. T. Wherry, Proc. U.S. Nat. Mus., 1916, vol. li, p. 84.) Synonym of Psilomelane (W. Haidinger, 1828) with the termination *ite*.

Crystalline psilomelane is distinguished by L. L. Fermor (Rec. Geol. Survey India, 1917, vol. xlviii, p. 120) as X-psilomelane [perhaps a misprint for χ-psilomelane], and is considered to be identical with hollandite. The colloidal form he describes as κ-hollandite or simply as psilomelane. (*See* seventh list under Diasporogelite.)

Racewinite. A. N. Winchell, 1918. Economic Geology, vol. xiii, p. 611. Hydrated silicate of aluminium and iron (Fe_2O_3 7·37 per cent.)

approximating to the formula $2(Al,Fe)_2O_3 . 5SiO_2 . 9H_2O$. The bluish-green, coarsely crystalline masses change on exposure to brownish-black, and the material undergoes certain other remarkable changes in colour. It occurs in metamorphic limestone at Bingham, Utah. Named from Racewin, the cable address of H. V. Winchell, who collected the material examined.

Riversideite. A. S. Eakle, 1917. Bull. Dep. Geol. Univ. California, vol. x, p. 347. Hydrated calcium silicate, perhaps $2CaSiO_3 . H_2O$, occurring as a white, fibrous material filling small veins in massive idocrase and blue calcite at Crestmore, Riverside Co., California. Named from the locality.

Sabalite. (D. B. Sterrett, Mineral Resources, U.S. Geol. Survey, for 1914, 1915, part II, p. 334; W. T. Schaller, ibid., for 1917, 1918, part II, p. 161.) Trade-name for a banded variscite, from Utah, used as a gem-stone. Compare Trainite.

Schadeite. M. Lazarevič, 1909. Zeits. Chem. Indust. Kolloide, vol. iv, p. 306 (Schadeit). The colloidal equivalent of plumbogummite; the material from Huelgoat, Brittany, being partly optically isotropic and in part showing a chalcedonic structure. Named after Dr. Heinrich Schade, of Kiel.

Schernikite. D. S. Martin, 1912. Annals New York Acad. Sci., vol. xxi, p. 189. A pink, fibrous variety of muscovite occurring intergrown with lepidolite at Haddam Neck, Connecticut. Named after Mr. Ernest Schernikow, of New York, who presented to the Oxford Museum the specimens described by H. L. Bowman, Mineralogical Magazine, 1902, vol. xiii, p. 98. A special name is here clearly superfluous.

Sobralite. J. Palmgren, 1917. Bull. Geol. Inst. Univ. Upsala, vol. xiv, p. 173 (Sorbalit). A triclinic manganese pyroxene, $4MnSiO_3 . 2FeSiO_3 . CaSiO_3 . MgSiO_3$, from Tunaberg, Sweden, differing from pyroxmangite (7th list) in the position of the optic axial plane. Named after Dr. J. M. Sobral, of Buenos Aires. Compare Vogtite.

Soda-sarcolite. W. T. Schaller, 1916. Bull. U.S. Geol. Survey, No. 610, p. 112 (soda-sarcolite), p. 115 (soda sarcolite). A hypothetical molecule, $3Na_2O . Al_2O_3 . 3SiO_2$, corresponding with sarcolite but containing sodium in place of calcium, assumed to explain the composition of minerals of the melilite group. It is present to the extent of

2·2 per cent. in a melilite from Vesuvius. A ferric iron sarcolite, $3CaO . Fe_2O_3 . 3SiO_2$, is also suggested (p. 119).

Sorbite. *See* Cochranite.

Spencerite. T. L. Walker, 1916. Nature, London, vol. xcvii, p. 375; Mineralogical Magazine, vol. xviii, p. 76; Journ. Washington Acad. Sci., 1917, vol. vii, p. 456; Univ. Studies, Geol. Ser. No. 10, Toronto, 1918. A. H. Phillips, Amer. Journ. Sci., 1916, ser. 4, vol. xlii, p. 275. A hydrated basic zinc phosphate, $Zn_3(PO_4)_2 . Zn(OH)_2 . 3H_2O$, occurring in some abundance as pearly white, scaly cleavage masses, and small monoclinic crystals, forming large stalactites thinly encrusted with hemimorphite, from Salmo, British Columbia. Named after Leonard James Spencer, of the Mineral Department, British Museum. (*See* Lusitanite.)

The same name (Spencerit) had been used earlier (C. Hlawatsch, Min. Petr. Mitt., 1903, vol. xxii, p. 498) for an artificial furnace product, the rhombic modification of iron carbide, Fe_3C, or $(Fe,Mn)_3(C,Si)$ corresponding with Spiegeleisen, as distinct from the anorthic modification corresponding with ferro-manganese (cf. Mineralogical Magazine, 1903, vol. xiii, p. 296).

Starolite. (J. B. Sterrett, Mineral Resources, U.S. Geol. Survey, for 1914, 1915, part II, p. 324; W. T. Schaller, ibid., for 1917, 1918, part II, p. 162.) Jeweller's trade-name for asteriated quartz showing a six-rayed star by reflected light.

Strontiohitchcockite. E. T. Wherry, 1916. *See* Bariohitchcockite.

Sulphate-apatite. R. Brauns, 1916. Neues Jahrb. Min., Beilage-Band xli, p. 60 (Sulfatapatit). Small, colourless crystals of apatite occurring in the sanidinite bombs of the Laacher See district, Rhine, contain some sulphuric acid (SO_3 1·13–1·35 per cent.) in addition to fluorine and chlorine. The molecule $3Ca_3P_2O_8 . CaSO_4$ therefore enters into their composition, the general formula for apatite being

$$3Ca_3P_2O_8 . Ca(F_2,Cl_2,SO_4,CO_3,O,[OH]_2).$$

Sulphatic Cancrinite. E. S. Larsen and G. Steiger, 1916. Amer. Journ. Sci., ser. 4, vol. xlii, p. 332. A cancrinite from Colorado with about half of the CO_3 isomorphously replaced by SO_4.

Sulphurite. (E. T. Wherry, Journ. Washington Acad. Sci., 1917, vol. vii, p. 447 (sulfurite); Chem. News, 1917, vol. cxvi, p. 251 (sulphurite).) A mineralogical name for native sulphur. The name Sulfurit has been previously used (F. Rinne, 1902; third list) for naturally-occurring amorphous sulphur.

Tangiwaite. (R. Koechlin, Mineralogisches Taschenbuch der Wiener Mineralogischen Gesellschaft, 1911, p. 55 (Tangawait).) A variety of serpentine, identical with bowenite, from New Zealand. The Maori name, tangiwai, for the stone means 'tear-water', since polished specimens have the appearance of drops of water. For a description of the mineral and its occurrence see F. Berwerth, Sitz.-Ber. Akad. Wiss. Wien, Math.-naturw. Cl., 1880, vol. lxxx (for 1879), Abt. I, p. 116; A. M. Finlayson, Quart. Journ. Geol. Soc. London, 1909, vol. lxv, pp. 361, 369.

Trainite. (W. T. Schaller, Mineral Resources, U.S. Geol. Survey, 1918, for 1917, part II, p. 163.) An impure banded variscite from Manhattan, Nevada. Named after the collector, Mr. Percy Train, of Manhattan. A specimen so named, and described on the dealer's label as aluminium phosphosilicate, was acquired by the British Museum mineral collection in 1913. The material has been described, although not under this name, by E. T. Wherry (Journ. Washington Acad. Sci., 1916, vol. vi, p. 105; and Chem. News, 1916, vol. cxiii, p. 290), who determines it to be a lamellar intergrowth of colloidal vashegyite ($4Al_2O_3 . 3P_2O_5 . 30H_2O$; fifth list) and a hydrated calcium aluminium silicate near the zeolite laubanite. Compare Sabalite.

Tungstenite. R. C. Wells and B. S. Butler, 1917. Journ. Washington Acad. Sci., vol. vii, p. 596. Tungsten sulphide, probably WS_2, occurring as minute graphite-like scales intimately intermixed with other minerals in a compact ore from the Little Cottonwood district, Utah. Named from analogy to molybdenite.

Turite. (J. A. Samoilov, Bull. Soc. Nat. Moscou, 1900, vol. xiv (for 1899), p. 142, Турьитъ). The correct form of the name Turgite (R. Hermann, 1845) or Turjit (R. Hermann, 1860), after the Turya (Turia, Turja, Турья) river, northern Urals. See this vol., p. 341.

Uhligite. F. Cornu, 1909. Zeits. Chem. Indust. Kolloide, vol. iv, p. 17 (Uhligit). Apparently given as an alternative name for gelvariscite (q. v.) for the amorphous variscite of Leoben in Styria; but it also appears as an alternative name for gelfischerite (q. v.) for the amorphous fischerite of Roman-Gladna in Hungary. Probably named after Viktor Karl Uhlig (1857–1911), Professor of Geology at Vienna. Not the uhligite of O. Hauser, 1909 (fifth list).

Viridite. F. Kretschmer, 1918. Neues Jahrb. Min., 1918, p. 19 (Viridit); Archiv f. Lagerstättenforschung, Berlin. A chloritic

mineral approximating in composition to hydrated ferrous silicate, $4FeO \cdot 2SiO_2 \cdot 3H_2O$, occurring as compact, leek-green masses in diabase and schalstein in northern Moravia and southern Silesia, where, with mackensite (q. v.), &c., it is mined as an ore of iron. The optical characters of the minute needles and scales indicate monoclinic symmetry. Named from *viridis*, green. Not the viridite of H. Vogelsang, 1872.

Vitrain. M. C. Stopes, 1919. *See* Fusain.

Vogtite. C. Hlawatsch, 1907. Zeits. Kryst. Min., vol. xlii, p. 593 (Vogtit). A crystallized slag of unknown origin and chemical composition: the triclinic crystals possess a certain resemblance to rhodonite and were found to contain much manganese. The material is assumed to belong to the triclinic group of slags with the composition $(Mg,Fe,Mn)SiO_3$, studied by Professor Johan H. L. Vogt, of Christiania, after whom it is named. The angles of the crystals correspond with those of a triclinic metasilicate $(Fe,Ca.Mn,Mg)SiO_3$ formed in acid steel-furnace slags and described by A. F. Hallimond, Mineralogical Magazine, 1919, vol. xviii, p. 368. Compare Sobralite.

Winchellite. D. S. Martin, 1912. Annals New York Acad. Sci., vol. xxi, p. 190. Synonym of lintonite. Named after Professor Newton Horace Winchell (1839–1914), who examined the material and found it to be distinct in optical characters from both mesolite and thomsonite (Amer. Geol., 1898, vol. xxii, p. 349).

Xanthochroite. A. F. Rogers, 1917. Journ. Geol. Chicago, vol. xxv, p. 524. Amorphous cadmium sulphide, probably containing some adsorbed water, $CdS \cdot xH_2O$, occurring as a thin, powdery, yellow coating on blende. It has hitherto been referred to the hexagonal species greenockite, but it is now to be regarded as the amorphous equivalent of this. Named from *ξανθός*, yellow, and *χρῶμα*, colour. It is possible, however, that, being optically isotropic, this material may be the cubic modification of cadmium sulphide, corresponding with zinc-blende.

Zebedassite. A. Brusoni, 1917. Rend. R. Ist. Lombardo, ser. 2, vol. l, p. 646; Riv. Min. Crist. Italiana, 1918, vol. l, p. 74. Hydrated silicate of magnesium and aluminium, $H_8Al_2Mg_5(SiO_4)_6$, occurring as silky white, fibrous (orthorhombic?) aggregates in fissures of an altered serpentinous rock. Named from the locality, Zebedassi, near Volpedo in Piedmont.

Zirkite. Monthly Price List, Foote Mineral Company, Philadelphia, September 1916, p. 26; November 1916, p. 29; Mineral Foote-Notes, March 1917, p. 2. Trade-name for a zirconia-ore from Brazil containing 73–97 per cent. ZrO_2. It is stated to be a mechanical mixture of baddeleyite, zircon, and a new zirconium silicate (*see* Orvillite). [It includes the 'favas' of zirconia described by E. Hussak in 1899, and the large mamillated lumps with radially-fibrous structure described by E. Hussak and J. Reitinger in 1903; the latter was regarded as possibly a modification of zirconia distinct from baddeleyite.] *See* Caldasite.

SYSTEMATIC CLASSIFICATION OF NEW MINERALS.[1]

Elements.

Osmite, Os.

Sulphides, &c.

Tungstenite, WS_2.
Xanthochroite, colloidal CdS.
Oruetite, Bi_3TeS_4.

Sulpho-salts.

Mullanite, $5PbS . 2Sb_2S_3$.

Haloids.

Lorettoite, $6PbO . PbCl_2$.
Creedite,
$2CaF_2 . 2Al(F,OH)_3 . CaSO_4 . 2H_2O$.

Oxides.

Lithargite, PbO.
Högbomite, $MgO . 2(Al_2O_3,Fe_2O_3,TiO_2)$.
Doelterite, Hyd. TiO_2.

Carbonates.

Ambatoarinite,
$5SrCO_3 . 4Ce_2(CO_3)_3 . Ce_2O_3$.
Basobismutite, $2Bi_2O_3 . CO_2 . H_2O$.

Sulphates.

Gilpinite, $(Cu,Fe)O . UO_3 . SO_3 . 4H_2O$.

Borates.

Magnesioludwigite,
$4MgO . Fe_2O_3 . B_2O_3$.

Phosphates, Arsenates, &c.

Carbonate-apatite, $3Ca_3P_2O_8 . CaCO_3$.
Sulphate-apatite, $3Ca_3P_2O_8 . CaSO_4$.
Crandallite, $CaO . 2Al_2O_3 . P_2O_5 . 5H_2O$.
Arsenobismite, $2Bi_2O_3 . As_2O_5 . 2H_2O$.
Spencerite, $Zn_3(PO_4)_2 . Zn(OH)_2 . 3H_2O$.
Katoptrite,
$14(Mn,Mg,Fe)O . 2(Al,Fe)_2O_3 . Sb_2O_3 . 2SiO_2$.
Cornetite, phosphate Cu,Co.

Silicates.

Iron-anthophyllite, $FeSiO_3$.
Amosite, iron-amphibole.
Collbranite, var. of Pyroxene.
Sobralite, $Mn_4Fe_2CaMg(SiO_3)_8$.
Crestmoreite, $CaSiO_3 . H_2O$.
Riversideite, $2CaSiO_3 . H_2O$.
Eakleite, $5CaSiO_3 . H_2O$.
Margarosanite, $PbCa_2(SiO_3)_3$.
Manganfayalite, $(Fe,Mn)_2SiO_4$.
Colerainite, $4MgO . Al_2O_3 . 2SiO_2 . 5H_2O$.
Zebedassite, $H_8Al_2Mg_5(SiO_4)_6$.
Orvillite, $8ZrO_2 . 6SiO_2 . 5H_2O$.
Ektropite, $12MnO . 8SiO_2 . 7H_2O$.
Leifite, $Na_4(AlF)_2Si_9O_{22}$.
Racewinite, $2(Al,Fe)_2O_3 . 5SiO_2 . 9H_2O$.
Griffithite,
$4(Mg,Fe,Ca)O . (Al,Fe)_2O_3 . 5SiO_2 . 7H_2O$
Mackensite, $Fe_2O_3 . SiO_2 . 2H_2O$.
Viridite, $4FeO . 2SiO_2 . 3H_2O$.
Ferrierite,
$(Mg,Na_2,H_2)_4Al_2(Si_2O_7)_5 . 6H_2O$.
Flokite, $H_8(Ca,Na_2)Al_2Si_9O_{26} . 2H_2O$.

Titanates.

Oliveiraite, $3ZrO_2 . 2TiO_2 . 2H_2O$.

[1] Only the more important names given in the preceding alphabetical list are here included.

OBITUARIES.

Max Hermann Bauer (1844–1917) was born at Gnadenthal in Württemberg and was a great-grandson of the Stuttgart mineralogist J. F. W. Widenmann (1764–98). Since 1884 he was Professor of Mineralogy and Petrology in the University of Marburg. Previously he was professor at Königsberg, and for a time was attached to the Prussian Geological Survey. Since 1884, also, he was one of the joint editors of the 'Neues Jahrbuch für Mineralogie, Geologie, und Paläontologie', and of the 'Centralblatt für Mineralogie', &c., since its commencement in 1900. To these journals he contributed a very large number of abstracts and reviews. Beilage-Band xxxix of the Jahrbuch was issued as a 'Festschrift Max Bauer' on the occasion of his seventieth birthday: this contains an excellent portrait. He was the author of several papers on crystallized minerals and on petrography; special mention may be made of those on the crystallography and twinning of scheelite (1871) and on laterite (1898 and 1907). His 'Lehrbuch der Mineralogie' passed through two editions (1886 and 1904); and the same was the case with his large volume on precious stones ('Edelsteinkunde', 1895–6 and 1909), by which work he is perhaps best known. An obituary notice by R. Brauns, one of his old pupils, has been given in the Centralblatt, 1918, pp. 73–84, with bibliography.

George Ferdinand Becker (1847–1919) was born in New York and studied at Harvard University, Heidelberg (Ph.D., 1869), and the Mining Academy at Berlin. In 1875 he was lecturer in mining and metallurgy in the University of California, and he joined the United States Geological Survey in 1879. His well-known monograph on the Comstock Lode in Nevada (1882) was one of the earliest books containing good coloured figures of micro-sections of rocks. In his monograph of the quicksilver deposits of the Pacific Slope (1888) he described knoxvillite, metastibnite, napalite, and redingtonite as new mineral-species, and drew attention to the recent formation of many minerals in the hot springs of this region. Although he wrote specially on the geology of ore-deposits, he had a very wide range of subjects; one paper, for example, being on the experimental determination of the linear force of growing crystals.

Friedrich Martin Berwerth (1850–1918) was born at Segesvár in Transylvania, and, after studying chemistry at Graz and Vienna, he graduated at Heidelberg in 1873. The following year he entered the Royal Mineralogical Collection at Vienna, then under the directorship of G. Tschermak; and at the same time he acted as Tschermak's assistant in the University. This collection was transferred to the new Natural History Museum in 1889, and Berwerth succeeded A. Brezina as director of the mineralogical and petrographical division in 1896. From this post he retired only shortly before his death. His place is taken by R. Koechlin. His life's work was thus in the museum; but he was also Professor of Petrography in the University of Vienna. Several of his earlier papers dealt with the jade minerals, while later he turned his attention to meteorites. He issued a series of coloured plates illustrating the different types of structure met with in igneous rocks ('Mikroskopische Structurbilder der Massengesteine', 1895–1900). After his retirement, he was preparing a second edition of Tschermak's 'Die mikroskopische Beschaffenheit der Meteoriten', and he had in view a much-wanted treatise on meteorites. (Verh. Geol. Reichsanstalt, Wien, 1918, pp. 244–247.)

Amos Peaslee Brown (1864–1917) was Professor of Mineralogy and Geology in the University of Pennsylvania, and at one time was on the staff of the Geological Survey of Pennsylvania. He wrote several papers on the mineralogy and palaeontology of Pennsylvania, and was responsible for the third and fourth editions of Erni's 'Mineralogy simplified'. His principal published work, however, dealt with the crystallography of the haemoglobins. (Bull. Geol. Soc. Amer., 1918, vol. xxix, pp. 13–17, with bibliography and portrait; Amer. Min., 1918, vol. iii, pp. 21–23.)

Charles Barrington Brown (1839–1917) was born at Cape Breton in Nova Scotia, and was educated at Harvard University and the Royal School of Mines in London (1862–4). He did geological survey work in the West Indies and in British Guiana, explored the Amazon, and was connected with gem-mining in North Carolina, Ceylon, and New South Wales. After the conquest of Burma, he visited (in 1887) the famous ruby mines and reported on them to the Government of India, but the detailed account, written in collaboration with Prof. J. W. Judd, was not published until 1896. (Geol. Mag., 1917, pp. 235–238, with portrait.)

Josef Bruckmoser (–1914) fell in battle in the eastern Carpathians. He was born in Vienna, and for a time was demonstrator and later assistant (1904–6) under Tschermak in the Mineralogical Institute of the University of Vienna. Here he published papers on the cause of the colour of blue rock-salt and on the constitution of the silicic acids separated from harmotome and titanite. Later, he became a schoolmaster at Berndorf in Lower Austria, working in his spare time at the petrography of Asia Minor. (Min. Petr. Mitt., 1915, vol. xxxiii, p. 280.)

August Brunlechner (1846–1916) was curator of the mineral collection in the Carinthian Museum and also at one time professor in the Mining School at Klagenfurt. He wrote on Carinthian minerals and ore-deposits, and was the author in 1884 of the book 'Die Minerale des Herzogthums Kärnten'. (Mitt. Wiener Mineralog. Gesell., 1916, No. 79, p. 36, issued with Min. Petr. Mitt., 1917, vol. xxxiv.)

Reginald Cooksey Burton (1890–1916) took the degree of B.Sc. at Durham University (Armstrong College) in 1910, and joined the Geological Survey of India as assistant superintendent in 1912. He had written on the origin of bauxite and on twinned crystals of hambergite from the sapphire mines of Kashmir, and was a promising worker. He joined the Indian Army in 1915, and was killed in Mesopotamia. (Rec. Geol. Survey India, 1916, vol. xlvii, p. 143.)

George Steuart Corstorphine (1868–1919) was born at Edinburgh, where he was trained as a teacher. He was, however, specially interested in geology and became assistant to J. Geikie in the University of Edinburgh. In 1895 he graduated at Munich with a thesis on the igneous rocks of the southern portion of the island of Arran (Min. Petr. Mitt., 1895, vol. xiv, pp. 443–470). The same year he was elected Professor of Geology in the South African College at Cape Town, where he was also Keeper of Geology in the Museum and Director of the Geological Survey of Cape Colony. In 1902 he moved to Johannesburg as consulting geologist, and since 1913 was Principal of the South African School of Mines and Technology at Johannesburg. In collaboration with F. H. Hatch he wrote 'The Geology of South Africa' (1909), and gave a description of the 'Cullinan' diamond; he also described the occurrence of diamond in eclogite.

Sir William Crookes (1832–1919) was so well known in many fields of inquiry that it is necessary here to refer only to his connexion

with mineralogy. He was a member of this Society since 1888, although he never took any active part in its affairs. Crookesite, the rare selenide of copper and thallium, and for many years the only known mineral containing thallium as an essential constituent, was named by A. E. Nordenskiöld in 1866 in honour of Crookes's discovery, in 1861, of this chemical element. His well-known studies of the rare-earths led him to the examination of various rare-earth minerals; and from wiikite, of which he published an analysis in 1908, he isolated scandium for his researches on this element. The spectroscopic analysis of meteorites also claimed his attention. He was specially interested in diamond, making many experiments relative to its artificial production, phosphorescence, and change in colour when exposed to the emanations of radium. His excellent little book entitled 'Diamonds' (1909) was an extension of his British Association lecture at Kimberley in 1905; and in the same year the scientific examination of the 'Cullinan' diamond was entrusted to him. Some of the diamonds which he had experimented with, he presented in 1916, together with various other mineral specimens, to the British Museum collection of minerals. In the 'Chemical News', a weekly periodical founded by Crookes in 1859 and edited by him for sixty years, a large number of mineralogical articles have been published. His 'Select Methods in Chemical Analysis' (1871; 4th edit., 1905) is of service to mineral chemists.

James Douglas (1837–1918) graduated as B.A. in 1858 at Queen's University, Kingston, Canada, and was LL.D. of McGill University. For several years he was Professor of Chemistry at Morrin College, Quebec. With T. Sterry Hunt he published papers on the hydrometallurgy of copper. In 1873 he became associated with the copper industry of the United States, at first having charge of the works at Phoenixville, Pennsylvania, and later president of the Copper Queen Mining Company of Arizona. From the latter locality he presented several fine large specimens of copper minerals to the British Museum collection. He was twice president of the American Institute of Mining Engineers. He died in New York and was buried in Quebec.

Alexander Moncrieff Finlayson (– 1917) came from New Zealand to London in 1908, and during two years as a research student at the Royal College of Science he published a remarkable series of brilliant papers. These dealt with the ore-deposits of the British Isles and of Huelva in Spain. He had previously given good accounts

of the nephrite, scheelite, and auriferous deposits of New Zealand. In 1900 he went to Burma as an oil technologist, returning to England at the outbreak of war. He died of wounds received in France.

Heinrich Ludwig Rudolf Fuess (1838–1917), of Steglitz, a suburb of Berlin, was well known as a maker of optical instruments, more especially those—goniometers, refractometers, microscopes, &c.—required for mineralogical work. Some of these—for example, heating attachments for the goniometer—he himself described in scientific journals, while others were described by C. Leiss. Detailed descriptions of the instruments were also given in the well-illustrated catalogues of the firm of R. Fuess.

Louis Pope Gratacap (1850–1917), Curator of Mineralogy and Conchology in the American Museum of Natural History at New York, was born at Brooklyn of French descent. Entering the museum in 1876, he served for the long period of forty-one years, earlier as assistant curator of minerals, and since 1900 as curator of both minerals and shells. The neat and orderly arrangement of these collections represent the work he had done. Previous to entering the museum, he had studied at a theological seminary, worked in a bank, been chemist at gas-works, and finally graduated at the School of Mines of Columbia University. He was a prolific writer on a variety of topics—philosophy, politics, religion, botany, geology, scientific romances, and novels. His few mineralogical works were popular in character. (Ann. Rep. Amer. Mus. Nat. Hist., for 1917, 1918, pp. 62–64, with portrait; Amer. Min., 1918, vol. iii, pp. 31–33, with portrait.)

Laura Hezner (1862–1916). A Bavarian by birth, Miss Hezner was interested in art, literature, philosophy, and ancient languages. At the age of thirty-six she commenced the study of natural science at the Technical School at Zurich, and in 1903 she took the degree of Ph.D. at the University of Zurich with a dissertation on eclogites and amphibolites with special reference to occurrences in the Oetz-Thal. As Privat-Dozent and assistant in chemistry, mineralogy, and petrography in the Technical School, she made a large number (over 400) of detailed analyses of rocks and minerals, mostly from Swiss localities. These were usually published in the works of other authors, but are collected together in 'Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich', 1916, vol. lxi, pp. 149–202. One of the mineral analyses is of the Tasmanian stichtite to which she applied the name chrom-brugnatellite. (U. Gruben-

mann, Vierteljahrsschrift Naturforsch. Gesell. Zürich, 1916, vol. lxi, pp. 742–745; 1917, vol. lxii, p. 728, bibliography.)

William Earl Hidden (1853–1918) was early engaged as an artist. In 1879 he was sent by T. A. Edison to search for platinum in the southern Appalachians. Although not commercially successful as regards platinum, this led to the discovery, especially in North Carolina, of other valuable minerals; for example, workable deposits of monazite sand, emeralds, and the green gem spodumene (afterwards called hiddenite) at Stony Point, and later the rubies at Cowee Creek (described in vol. xii of this Magazine). Another remarkable mineral deposit worked by Hidden for commercial purposes is that of rare-earth minerals at Barringer Hill in Llano Co., Texas. These occurrences were well described by him in a number of papers in the American Journal of Science; and he also published several papers on meteorites. Either alone or in collaboration with other authors he described no less than fourteen new species of minerals, including, for example, the well-known names rhodolite, hamlinite, hanksite, sulphohalite, mackintoshite, thorogummite, yttrialite, and yttrocrasite.

George Thomas Holloway (1863–1917) entered the Royal College of Science in 1881 and was assistant demonstrator in chemistry during 1884–6, after which he practised in London as a consulting metallurgist and assayer. He recently acted as chairman of the Royal Ontario Nickel Commission, the lengthy report of which was issued only shortly before his death. Unusual minerals often came into his hands in the course of business, and he had an eye for a good specimen.

Thomas McKenny Hughes (1832–1917) joined the Geological Survey of England in 1861, and in 1873 he succeeded Adam Sedgwick as Professor of Geology at Cambridge. Sedgwick was elected in 1818, so that the chair was held by these two professors for very nearly a century. Hughes became a member of this Society in 1878, and he contributed a paper on beekite to volume viii of the Magazine. A sketch of his life and work was given in the Geological Magazine, 1906, dec. 5, vol. iii, pp. 1–13, with bibliography and portrait.

John Duer Irving (1874–1918), son of the geologist Roland Duer Irving (1847–88), graduated at Columbia University, and in 1900 joined the United States Geological Survey. Since 1907 he was Professor of Economic Geology in the Sheffield Scientific School of Yale University,

and was editor of the journal 'Economic Geology' since its commencement in 1905. He was one of the first to join the American Army in France, and died from an attack of pneumonia following on influenza. (Economic Geology, 1918, vol. xiii, pp. 413–418, with portrait.)

James Paul Johnson (1880–1918) was born in London and educated at the Royal School of Mines. On account of his health he went to South Africa in 1902. He wrote on the Pleistocene geology of the South of England, and on South African geology and archaeology, also two books, 'The Mineral Industry of Rhodesia' (1911) and 'The Ore Deposits of South Africa' (1908–9).

Robert Marc (1876–1918) was Extraordinary Professor of Physical Chemistry in the University of Jena. He wrote on colloids in relation to minerals and on the growth and solution of crystals. (Centralblatt Min., 1918, pp. 229–231, with bibliography.)

Julian Niedźwiedzki (1845–1918) was born at Przemysl in Galicia, and since 1873 was Professor of Mineralogy and Geology in the Technical High School at Lemberg. Previously (1870–2) he was attached to the Austrian Geological Survey. He wrote on the salt deposits of Wieliczka and Kalusz, and published in 1909 a Polish textbook on petrography. Delatynite was described by him as a new variety of amber from the Carpathians.

Anton Pelikan (1861–1918) was born in Vienna, and since 1899 was Professor of Mineralogy and Petrography in the German University at Prague. He described various zeolitic minerals from Bohemia, amongst them the new species zeophyllite.

Albert Ritzel (1881–1916) was Extraordinary Professor of Mineralogy in the University of Jena, and was killed near Verdun. He had written several papers on crystal physics: namely, on plasticity and translation; rate of growth and solution on different faces; and the influence of substances in solution on the habit of crystals. (Centralblatt Min., 1916, p. 432.)

Alexander John Robertson (1887–1915) left his post as Assistant Mineralogist and Chemist on the Geological Survey of Western Australia, becoming a Lieutenant in the 11th Battalion of the Australian Imperial Force. He was unfortunately killed in the Dardanelles on August 6, 1915, within a quarter of an hour of taking up his position in the trenches. He had spent five years at the University of Melbourne,

taking the degrees of M.Sc. and B.Eng., and gaining the Kernot Research Scholarship in Geology. He had done original work in petrology and described felspars from Kalgoorlie.

Vincente de Souza Brandão (1863–1916) was born at Lisbon and educated at the University of Coimbra; he also studied at Paris and Freiberg in 1892. In 1889 he entered the Corps of Engineers of Mines, and in 1898 succeeded A. Bensaude as chief of the section of mineralogy and petrography on the Geological Survey of Portugal. He wrote on mathematical and optical crystallography and on Portuguese rocks and minerals, and also devised improvements in certain instruments for optical work. (Communic. Commiss. Serv. Geol. Portugal, 1918, vol. xii (for 1917), p. viii; 1911, vol. viii, p. 178, bibliography.)

Charles Otto Trechmann (1851–1917). Born at Hartlepool on March 19, 1851, Charles Otto Trechmann died at his residence, Hudworth Tower, Castle Eden, on June 29, 1917, in the sixty-seventh year of his age. He joined the Society in 1877, and was therefore a member for just forty years. At one time he was often to be seen at its meetings, but as time passed on and business called him less frequently to London, he found fewer opportunities of being present, and it is more than ten years since he last attended a meeting; nevertheless, to the end he never lost his interest in the Society or the science that it fosters.

His father, Peter Otto Edward Trechmann, a Dane by birth, settled in the North of England in the year 1843, and five years later, in 1848, founded the cement manufactory, now known as Otto Trechmann, Limited, which is one of the oldest of the kind in the United Kingdom. About that time he married, and Charles Otto was the eldest of a large family, which comprised eight sons and two daughters.

After a preliminary education at the Grammar School, Richmond, Yorkshire, Charles Otto Trechmann was sent to the Polytechnic School at Hanover; subsequently he entered the University at Heidelberg, and after studying chemistry for two years under the famous Bunsen proceeded to the doctorate of philosophy. Upon his return to England he entered his father's business, and it was largely to his untiring energy and business acumen that its development and prosperity were due, and as a matter of course, when the time came for the business to be converted into a limited liability company, he became the first managing director, an office he held to the day of his death. He was also managing director of two allied concerns, viz. Trechmann, Weekes & Company, Limited, of Halling, Rochester, Kent, and the Purfleet Chalk

Quarries, Purfleet, Essex. He also found time to discharge the duties of a citizen of his standing, and for many years was a Justice of the Peace for the borough of Hartlepool. In 1879 he married Gertrude Elizabeth, the eldest daughter of the Rev. Robert Taylor, Vicar of Hesleden, a small village a little to the north of Hartlepool. The early years of his married life were spent in Hartlepool, but, in 1892, he removed to Hudworth Tower, a residence pleasantly situated in Castle Eden, a village also near Hartlepool, and adjoining his wife's old home, and it was here that he died after a distressing illness. His widow and two children, a son and a daughter, survive him.

While still at Heidelberg, he began to take an interest in minerals, and commenced the formation of a collection. This interest he never lost; whenever he had the opportunity, he looked out for the chance of acquiring interesting specimens, and he had ever a keen eye for a well-crystallized specimen. At his death his collection numbered about 5,000 choice specimens, which were housed in two well-made cabinets standing in his study at Hudworth Tower. He bequeathed some of his finest specimens to the British Museum, which institution was fortunate enough to be able to obtain further specimens by the generosity of his son, Dr. Charles Taylor Trechmann, to whom all the collections were left. In later years he also turned his attention to entomology, and formed a local collection of Diptera of considerable scientific value as well as a fine collection of exotic Rhopalocera. Although a busy commercial and public life did not leave him much leisure for the pursuit of scientific investigation, he was the sole or part author of twenty papers, mostly on crystallographical subjects, all his work being characterized by careful observation and skilful drawing. Some of the more important of his papers deal with minerals found in the famous Binnenthal, Switzerland, and after him a new sulpharsenite of silver discovered there was named trechmannite by its finder, Mr. R. H. Solly. Besides being a member of the Mineralogical Society, he was also a Fellow of the Geological Society, having been elected in 1882.

Those who, like the writer, were privileged to share with him at times a few pleasant moments in gossip about crystals will cherish the memory of his perfect courtesy and charm of manner.

G. F. H. S.

Charles Richard Van Hise (1857–1918) was born at Fulton in Wisconsin, and educated at the University of Wisconsin, where he was later Professor of Geology and, since 1903, President. He was long

connected with the United States Geological Survey, writing a monumental 'Treatise on Metamorphism' (1904) and several monographs on the iron-ores of the Lake Superior region.

John Watson (1842–1918), after retiring from business as managing director of Portland-cement works at Newcastle-upon-Tyne, settled in Cambridge and devoted himself to the formation of a collection of building stones and materials, which he presented to the Sedgwick Museum of Geology at Cambridge. Two excellent catalogues of this extensive collection had been published by him, namely 'British and Foreign Building Stones' (1911) and 'British and Foreign Marbles and other Ornamental Stones' (1916); and others, dealing with slates, limes, and cements, were in preparation. The honorary degree of M.A. was conferred on him in 1911 by the University of Cambridge.

Arthur Edward Victor Zealley (1886–1918) was elected a member of this Society in 1914. After taking the associateship of the Royal College of Science in London he was a demonstrator in geology in the college. In 1909 he went to South Africa as Curator of the Rhodesian Museum at Bulawayo, and in 1911 joined the Geological Survey of Southern Rhodesia. He wrote several short papers on Rhodesian minerals. Before going to South Africa he had collected material in the crystalline limestone district of Donegal, which he intended to describe in detail, but only a preliminary account was published. He died of influenza. (Geol. Mag., 1919, p. 192.)

REVIEWS.

Mining Engineers' Handbook. Edited by ROBERT PEELE. Pp. x + 2375, illustrated. First edition. (New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1918. Price 23*s.* net.)

THIS useful book of reference—a veritable mine of information—consists of a series of forty-four sections written by several authors, many of whom are colleagues of the editor in the School of Mines of Columbia University. It is modelled on much the same lines as the several existing handbooks for engineers, such as the well-known 'Trautwine' and 'Molesworth'. It covers a very wide field, and its scope can be best indicated by quoting the headings of the several sections:

Mineralogy—Geology and Mineral Deposits—Earth Excavation—Explosives—Rock Excavation—Tunneling—Shaft-sinking in Rock—Shaft-sinking in Soft, Water-bearing Soils—Boring—Prospecting, Development and Exploitation of Mineral Deposits—Underground Transport—Hoisting Plant, Shaft Pockets and Ore Bins—Drainage of Mines—Mine Ventilation—Compressed-air Plant—Electric Power for Mine Service—Surveying—Underground Surveying—Mine Geologic Maps and Models—Mine Organization and Accounts—Cost of Mining—Wages and Welfare—Mine Air, Hygiene, Explosions, and Accidents—Mining Laws—Mine Examinations, Valuations and Reports—Aerial Tramways and Cableways—Mechanical Conveyors—Ore Dressing—Ore Sampling—Assaying—Testing of Ores—Notes on Selling, Purchasing, and Treatment of Ores—Gold Amalgamation and Cyanidation—Preparation and Storage of Anthracite Coal—Preparation and Coking of Bituminous Coal—Mathematics and Mechanics—Chemical Notes and Tables—Elements of Hydraulics—Engineering Thermodynamics—Steam Engines, Boilers, Pumps, Turbines, Gas Engines—Mechanical Engineering Miscellany—Electrical Engineering—Elements of Structural Design—Engineers' Tables.

The section on Mineralogy, by Professor A. J. Moses, extends to 72 pages, a large part of which is occupied by descriptive and determinative tables dealing with some two hundred mineral species. There are also useful lists giving information as to the occurrence, associations,

and uses of minerals. The section on Geology and Mineral Deposits, by Professor J. F. Kemp, gives still further details, here arranged under the different metals and under the heading non-metallic minerals. To each section useful bibliographies are appended. The book is well printed on thin paper of good quality, and is neatly bound with gilt edges in flexible leather. It is provided with a good index and is moderate in price.

Introduction to the Rarer Elements. By PHILIP E. BROWNING. Pp. x + 250, with coloured plate of spectra. Fourth edition. (New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1917. Price 7*s.* net.)

THE first edition of this work appeared in 1903, and was based on a course of lectures at Yale University. Owing to the rapid advances in this branch of chemistry, more especially for the radio-elements, the later editions have had to be thoroughly revised and added to. It is intended primarily as a textbook for advanced students, and does not attempt to treat the subject exhaustively. In the main it is, of course, purely chemical, with set experiments, separation tables, spectroscopic tables, a series of questions, &c. But under each element is given a useful list of minerals together with the percentage amounts of the element contained in them. There are also interesting historical details respecting the discovery of each element in various minerals. The technical applications are briefly mentioned in a separate chapter. A new kind of index, tabulated in columns, gives alphabetically only the names of the chemical elements: so unfortunately the book cannot be used for reference on the mineral side.

A Manual of Geometrical Crystallography treating solely of those portions of the subject useful in the identification of minerals. By G. MONTAGUE BUTLER. Pp. viii + 155, with 107 text-figures. First edition. (New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1918. Price \$1·50 = 7*s.* net.)

THIS small but expensive book forms a companion volume to the same author's 'Pocket Handbook of Minerals', noticed in this volume, p. 150. It is intended for beginners, and proceeds only so far as may be helpful in the 'sight recognition' of crystallized hand-specimens of minerals. The text is rather of the nature of a string of definitions, and, without the help of a teacher, would probably be somewhat confusing to a beginner. The prominence given to definitions is shown in the short

index of 109 entries, in which the word 'defined' is repeated no less than 62 times. On p. 109 there is a strange confusion between the tetragonal system, hemimorphism, and 'holohedral orthorhombic crystals' of hemimorphite. The several text-figures are small, but with bold outlines; many of them are not set straight on the page. There is a curious error—'Chrystallography'—in the name of the book on the cloth cover.

The author's three works 'A Pocket Handbook of Minerals' (1911), 'Pocket Handbook of Blowpipe Analysis' (1916, 80 pp.), and the present one on crystallography are also issued together in one binding with the same paginations as before, but with a fresh title-page 'Handbook of Mineralogy, Blowpipe Analysis and Geometrical Crystallography' (1918); the price of this larger volume is 16*s.* 6*d.*

Practical Instructions in the search for, and in the determination of, the useful minerals, including the rare ores. By ALEXANDER MCLEOD. Pp. xxvii + 254. Second edition. (New York: John Wiley & Sons, Inc.; London: Chapman & Hall, Ltd., 1917. Price 8*s.* 6*d.* net.)

THIS is quite an attractive-looking little volume, neatly bound and well printed. The printers have done their part of the work well. On looking more closely into the subject-matter, however, we find that the author has been less fortunate. Head-lines are plentiful and are well set out, but at times the text seems to bear little or no relation to them; and an attentive study of them has failed to reveal any definite plan in the volume. There is a good deal of needless repetition, and mistakes and misprints are to be found on almost every page. The index and table of contents also look quite good at first glance, but they will not bear close inspection. The few quite useful hints of an old prospector which the book contains are therefore unfortunately lost.

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250	9	*For* s *read* its.
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